# MON2000

## Software for Gas Chromatographs

## User Manual

**Applies to Both:**
**Daniel Danalyzer On-Line Gas Chromatographs**
**Rosemount Analytical Process Gas Chromatographs**

**Part Number 3-9000-522**

**Revision M**
**AUGUST 2005**

EMERSON
Process Management

# MON2000 Software for Gas Chromatographs User Manual

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# TABLE OF CONTENTS

**INTRODUCTION**

**1.1 Description of Manual ..... 1-1**
Section 1 – Introduction ..... 1-1
Section 2 – Installation and Startup ..... 1-2
Section 3 – Getting Started ..... 1-2
Section 4 – Control Functions ..... 1-2
Section 5 – Application Functions ..... 1-3
Section 6 – Chromatogram Viewer ..... 1-3
Section 7 – Reports ..... 1-3
Section 8 – Logs ..... 1-3
Section 9 – Data Collection ..... 1-4
Section 10 – Modbus Test ..... 1-4
Appendix A, PC Config Report ..... 1-5
Appendix B, Component Data Table ..... 1-5
Appendix C, Data Computations ..... 1-5
Appendix D, Analog Output Cal. 2350A GC ..... 1-5
Appendix E, Upgrade 2350A GC S/W and 2350 EPROMS ..... 1-5
Appendix F, Modbus Reg. List for 2350A GC ... 1-5

**1.2 Description of Online Help ..... 1-6**

**1.3 Description of MON2000 ..... 1-6**

**INSTALLATION AND SETUP**

**2.1 System Requirements ..... 2-1**

**2.2 Installing MON2000 Software ..... 2-3**

**2.3 Copying MON2000 to Disks ..... 2-3**

**2.4 Uninstalling MON2000 ..... 2-5**

**2.5 Starting MON2000 ..... 2-7**

**2.6 Performing Your First Logon ..... 2-8**
2.6.1 The Initial Logon ..... 2-8
2.6.2 Registering MON2000 ..... 2-9
2.6.3 Update MON2000 ..... 2-11

**2.7 Checklist for Setting Up MON2000 ..... 2-12**

**2.8 Communications ..... 2-12**

2.8.1 Connect to the GC Unit ..... 2-12

2.8.2 Disconnect from GC Unit ..... 2-13

**2.9 Customizing MON2000 ..... 2-14**

2.9.1 Configure Users ..... 2-14

2.9.2 Set Up GC Directory ..... 2-17

2.9.3 Dial-up Connection ..... 2-20

2.9.4 Modem Initialization Strings/Setup ..... 2-25
Black Box - Modem 325 ..... 2-26
U.S. Robotics Sportster ..... 2-27
GVC/MaxTech 28.8 Kbps Modem ..... 2-29

**2.10 2350 to 2350A Retrofit Instructions ..... 2-30**

**2.11 Conversion Process ..... 2-32**

**2.12 BASIC 2350A CONFIGURATION ..... 2-38**

**2.13 2350A Options ..... 2-40**

2.13.1 The COM4A Board ..... 2-40

2.13.2 2350A Modem Installation ..... 2-43

2.13.3 2350A Ethernet Installation ..... 2-46

2.13.4 Ethernet TCP/IP Settings ..... 2-50

2.13.5 MON2000 TCP/IP Settings ..... 2-53

**2.14 CONNECT VIA GC EXTERNAL MODEM ..... 2-55**

2.14.1 Hardware Setup ..... 2-55

2.14.2 Select Program Settings ..... 2-57

2.14.3 Generate PC Config Report ..... 2-59

**2.15 Downloading an Application ..... 2-61**

**2.16 Upgrading Flash ..... 2-64**

2.17 **Offline Edit of GC Application ..... 2-65**
2.17.1 File Selection ..... 2-66
2.17.2 Upload Application ..... 2-67
2.17.3 Upload BOS ..... 2-70

**GETTING STARTED**

**3.1 Logging On ..... 3-1**
**3.2 Logging Off ..... 3-3**
**3.3 MON2000 User Interface ..... 3-3**
3.3.1 Main Window ..... 3-4
3.3.2 GC Status Bar ..... 3-5
3.3.3 View Menu ..... 3-8
3.3.4 ToolTips ..... 3-8
3.3.5 Data Entry and Function Features ..... 3-8
3.3.6 Shortcut to Save or Print Data ..... 3-9
**3.4 Keyboard Shortcuts ..... 3-9**
**3.5 Procedures Guide ..... 3-11**
**3.6 Keylock Switch Control ..... 3-15**
**3.7 Configuring Your Printer ..... 3-16**
**3.8 Using Online Help ..... 3-18**
**3.9 Operating Modes for Model 700 ..... 3-19**
**3.10 About MON2000 ..... 3-19**

**CONTROL FUNCTIONS**

**4.1 Auto Sequence ..... 4-1**
**4.2 Single Stream ..... 4-2**
**4.3 Halt ..... 4-3**
**4.4 Calibration ..... 4-4**
**4.5 Baseline Run ..... 4-5**

**4.6 Valve Timing ..... 4-7**

**4.7 GC Time ..... 4-9**
4.7.1 View GC Time ..... 4-9
4.7.2 Set GC Time ..... 4-10

**4.8 Stop Now ..... 4-11**

**APPLICATION FUNCTIONS**

**5.1 System ..... 5-1**

**5.2 Component Data ..... 5-6**
5.2.1 Select Standard Component(s) ..... 5-10
5.2.2 Select Standard Values ..... 5-11
5.2.3 Update Standard Component(s) ..... 5-11
5.2.4 View Raw Data ..... 5-12
5.2.5 Sort Retention Time ..... 5-14

**5.3 Timed Events ..... 5-14**
Timed Events Description ..... 5-14
Valve Events ..... 5-15
Integration Events ..... 5-15
Spectrum Gain Events ..... 5-16

**5.4 User Defined ..... 5-19**
5.4.1 Numeric ..... 5-19
5.4.2 Selection ..... 5-20
5.4.3 Text Strings ..... 5-20

**5.5 Calculations ..... 5-21**
5.5.1 Control ..... 5-21
5.5.2 Averages ..... 5-23
5.5.3 User Defined ..... 5-25

**5.6 Limit Alarms ..... 5-27**
Limit Alarms Description ..... 5-30

**5.7 Discrete Alarms ..... 5-31**

**5.8 Streams ..... 5-33**

**5.9 Analog Inputs ..... 5-39**

**5.10 Analog Outputs ..... 5-43**
5.10.1 Analog Output Dialog Description ..... 5-43
5.10.2 Changing a Variable ..... 5-46
5.10.3 Changing the Bargraph ..... 5-46
5.10.4 Performing a Manual Calibration ..... 5-47
5.10.5 Performing an Automated Calibration ..... 5-48

**5.11 Discrete Inputs ..... 5-50**

**5.12 Discrete Outputs ..... 5-51**

**5.13 Valves ..... 5-52**

**5.14 Temperature Control ..... 5-55**

**5.15 Serial Ports ..... 5-57**
5.15.1 Serial Ports Configuration ..... 5-60

**5.16 GC Serial Port and Cable Configurations ..... 5-62**
5.16.1 GC DB-9 Serial to Ext. Modem DB-25 ..... 5-64
5.16.2 GC Phoenix Plug to Ext. Modem DB-25 ..... 5-65
5.16.3 Com ID ..... 5-66
5.16.4 Registers ..... 5-68
5.16.5 Setting Optional Base Pressures ..... 5-74
5.16.6 Setting Optional Base Results ..... 5-78

**5.17 TCP/IP, Subnet, and Gateway Menu ..... 5-82**

**CHROMATOGRAM VIEWER**

**6.1 Chromatogram Viewer Function ..... 6-1**

**6.2 Viewing a Live Chromatogram ..... 6-2**
6.2.1 From Online GC ..... 6-2
6.2.2 From GC Archive ..... 6-3
6.2.3 From File on Disk ..... 6-4

**6.3 Removing a Chromatogram from View ..... 6-8**

**6.4 Saving a Chromatogram to Disk ..... 6-8**

**6.5 Graph Functions ..... 6-9**
6.5.1 Editing the Chromatogram Graph ..... 6-9
6.5.2 Changing Cursor Size ..... 6-10
6.5.3 Printing the Chromatogram ..... 6-11

**6.6 Chromatogram Functions ..... 6-11**
6.6.1 Editing the Chromatogram ..... 6-12
6.6.2 Editing TEVs from CGM Viewer ..... 6-13
6.6.3 Editing Retention Times from CGM Viewer ..... 6-15
6.6.4 Editing TEVs from Cursor ..... 6-15
6.6.5 Viewing the Chromatogram Results ..... 6-16
6.6.6 Entering a Description ..... 6-18
6.6.7 Forcing a Calibration ..... 6-19
6.6.8 Toggling TEVs and CGM Components ..... 6-19

**6.7 Viewing Baseline Data ..... 6-20**

**6.8 Viewing RAW Data ..... 6-21**

**6.9 Display Options ..... 6-21**

**REPORTS**

**7.1 Report Display ..... 7-1**
7.1.1 View Report from Live Data ..... 7-1
7.1.2 View Report from File ..... 7-4
7.1.3 Print Report ..... 7-6
7.1.4 Save Report to Disk ..... 7-6
7.1.5 Report Contents ..... 7-8
Analysis Report ..... 7-9
Raw Data Report ..... 7-11
Calibration Report ..... 7-12
Final Calibration Report ..... 7-13
Average Reports ..... 7-14
Sample 24-Hour Average Report ..... 7-14

**7.2 GC Report Request ..... 7-15**

**7.3 GC Printer Control ..... 7-16**

**7.4 MON2000 Printer Control ..... 7-18**

**7.5 Archive Data ..... 7-20**

7.5.1 View Data Model 500/Model 700 ..... 7-21

7.5.2 Archive Export Data ..... 7-24

7.5.3 Reset ..... 7-27

**7.6 Trend Data ..... 7-28**

7.6.1 Trend Data Model 700/2350A GCs ..... 7-28

7.6.2 View Live Trend Online Model 700/2350A ..... 7-29

7.6.3 View Trend from File on Disk ..... 7-32

7.6.4 Edit Graph Display ..... 7-34

7.6.5 Changing Cursor Size ..... 7-34

7.6.6 Describe Trend ..... 7-35

7.6.7 Print Trend ..... 7-35

7.6.8 Save Trend ..... 7-36

7.6.9 Read Trend Archive ..... 7-36

7.6.10 Display Options ..... 7-37

**LOGS 8.1 Maintenance Log ..... 8-1**

**8.2 Parameter List ..... 8-3**

**8.3 Alarm Log ..... 8-6**

**8.4 Clear or Acknowledge Active Alarms ..... 8-9**

**8.5 Event Log ..... 8-9**

**MON2000 PLUS DATA COLLECTION/AUTO-POLLING**

**9.1 Overview ..... 9-1**
GC Controller Model Support ..... 9-2

**9.2 Data Collection Configuration ..... 9-3**
Polling Control Files ..... 9-3
Polling Control Commands ..... 9-3
Create a New Polling Control File ..... 9-5
Edit An Existing Polling Control File ..... 9-6
Connect Command ..... 9-8
Alarms Command ..... 9-9
Averages Command ..... 9-12
Calibration Command ..... 9-15
Event Log Command ..... 9-20
Registers Command ..... 9-23
Reports Command ..... 9-27
Maintenance Log Command ..... 9-30
Disconnect Command ..... 9-32
Await Command ..... 9-33
Delay Command ..... 9-36
Repeat Command ..... 9-37
Run Command ..... 9-38
End Command ..... 9-39

**9.3 Data Collection ..... 9-40**
Auto-Sequencing Status ..... 9-42
Stop Auto-Sequencing ..... 9-45
Transaction Log ..... 9-45

**MODBUS TEST**

**10.1 Starting WinMB ..... 10-1**

**10.2 Establishing Communications ..... 10-2**
10.2.1 Comparison of Modbus Protocols ..... 10-3
10.2.2 Set GC Com Parameters via MON2000 ..... 10-4
10.2.3 Set Up Port via WinMB ..... 10-5

**10.3 Getting Modbus Data ..... 10-7**
10.3.1 Use Single Data Type ..... 10-9
10.3.2 Use Template (Mixed Data Types) ..... 10-10

**10.4 Using Modbus Data ..... 10-13**
10.4.1 Set Log Parameters ..... 10-14
10.4.2 Save Modbus Data ..... 10-16
10.4.3 Assign Scale Ranges for User_Modbus..... 10-17
10.4.4 Print Modbus Data ..... 10-17

**10.5 Troubleshooting Communication Errors ..... 10-18**

**10.6 Using Modbus Test Online Help ..... 10-19**
10.6.1 How to Access ..... 10-19
10.6.2 How to Navigate ..... 10-20

**APPENDIX A, PC CONFIG REPORT**

**A.1 How to Print..... A-1**

**A.2 Example Report..... A-2**

**APPENDIX B, COMPONENT DATA TABLE**

**B.1 Component Data Table .....B-1**

**APPENDIX C, DATA COMPUTATIONS**

**C.1 Data Acquisition .....C-1**

**C.2 Peak Detection .....C-2**

**C.3 Analysis Computations .....C-4**
C.3.1 Conc. Analysis with Response Factor .....C-5
Calibration.....C-5
Calc. in Mole Percent w/o Normalization .....C-7

**C.4 Post Analysis Computations .....C-9**
C.4.1 Liquid Equivalent Computations.....C-9
C.4.2 Heating Value Calculations .....C-9
C.4.3 Multi-Level Calibration .....C-16
C.4.4 Indirect Calibration .....C-17

**APPENDIX D, ANALOG OUTPUT CAL. FOR 2350A**

**D.1 Calibrating by Volts ..... D-1**

**D.2 Calibrating by Percentages ..... D-5**

**APPENDIX E, UPGRADE 2350A GC S/W AND 2350 EPROMS**

**E.1 Connect to GC and Halt Analysis ..... E-1**
**E.2 OFFLINE EDIT TO UPLOAD APP. & RENAME .... E-1**
**E.3 Upgrade User-Defined Applications ..... E-3**
**E.4 Upgrade from Disk ..... E-3**
E.4.1 Upgrade from GC Controller ..... E-6
E.4.2 Configure GC Connection ..... E-9
**E.5 Disconnect Power and Disassemble ..... E-10**
**E.6 Replace EPROMS/Reset CPU ..... E-12**
**E.7 Reassembly Procedures ..... E-13**
**E.8 Set-Up and Programming ..... E-14**
E.8.1 Procedure ..... E-14
E.8.2 Reprogramming the DiskOnChip ..... E-16
E.8.3 GC Reassembly ..... E-17
**E.9 Connect to GC for Upgraded App. ..... E-18**
**E.10 Guide to Standard Application Files ..... E-19**
E.10.1 Importance of Standard Application Files ..... E-19
E.10.2 Standard Applications v1.50 and Later ..... E-20
E.10.3 Standard Applications Prior to v1.50 ..... E-22

**APPENDIX F, MODBUS REG. LIST FOR 2350A GC**

**F.1 Introduction – SIM_2251 & User_Modbus ..... F-1**
F.1.1 Notes on User_Modbus ..... F-1
F.1.2 Notes on SIM_2251 Modbus ..... F-2
**F.2 User_Modbus Register List ..... F-3**
F.2.1 SIM_2251 Modbus Register List ..... F-6

# INTRODUCTION

Welcome to the MON2000 *User Manual* (P/N 3-9000-522), a user guide that accompanies the MON2000 software produced by Daniel Measurement and Control, Inc., a Division of Emerson Process Management.

Use this manual for installing the MON2000 and Modbus Test (WinMB) software programs, getting started, checking various gas chromatograph (GC) application settings, and configuring and monitoring your GC system.

## 1.1 DESCRIPTION OF MANUAL

See the following section summaries or the Table of Contents for more information.

### Section 1 – Introduction

This section includes:

- summary listing of the manual sections
- description of the MON2000 User Guide online help file
- description of the MON2000 software program

### Section 2 – Installation and Startup

This section includes:

- short description of the MON2000 software
- minimum system requirements for installing MON2000 on a 32-bit Microsoft® Windows® platform
- installation and Startup instructions
- establishing communications and Logon procedures
- instructions for customizing MON2000 and setting up security
- instructions for downloading an application and using the Offline Edit function to change an application's configuration

### Section 3 – Getting Started

This section includes:

- instructions on how to log on and log off
- navigation instructions for MON2000
- listing of available procedures and keyboard shortcuts
- access and navigation instructions for the MON2000 User Guide online help file

### Section 4 – Control Functions

This section includes:

- description of available Control functions and detailed step procedures

### Section 5 – Application Functions

This section includes:

- description of available GC Application functions and detailed step procedures

### Section 6 – Chromatogram Viewer

This section includes:

- description of available Chromatogram Viewer functions and detailed step procedures to view, save, and print chromatograms

### Section 7 – Reports

This section includes:

- descriptions of available reports and sample outputs
- instructions on how to generate and print a given report

### Section 8 – Logs

This section includes:

- description of Maintenance, Alarm, and Event logs
- description of the Parameter List
- step procedures for viewing, editing, and clearing logs

### Section 9 – Data Collection

This section includes:

- descriptions of Data Collection and Auto-Sequencing
- instructions on how to configure, generate and run the Data Collection and Auto-Sequencing function using MON2000 PLUS

### Section 10 – Modbus Test

This section includes:

- short description of the WinMB software
- minimum system requirements for installing WinMB on a 32-bit Microsoft® Windows® platform
- installation and start up instructions
- description of available Modbus Test functions and detailed step procedures
- description of the WinMB online help file and navigation instructions

### Appendix A, PC Config Report

This appendix provides a sample PC Config Report for reference only.

### Appendix B, Component Data Table

This appendix provides two sample Component Data Tables for reference only.

### Appendix C, Data Computations

This appendix discusses the various equations and computations involved with acquisition and analysis tasks.

### Appendix D, Analog Output Cal. 2350A GC

This appendix demonstrates how to calibrate an analog output for a 2350A GC Controller, using the MON2000 software.

### Appendix E, Upgrade 2350A GC S/W and 2350 EPROMS

This appendix describes how to upgrade the GC software and the 2350 GC Controller EPROMS, the 2350A WinSystems CPU, P/C104 Bus, and DiskOnChip.

### Appendix F, Modbus Reg. List for 2350A GC

This appendix explains the differences between SIM_2251 and User_Modbus protocols, and lists the corresponding Modbus registers used by the 2350A GC Controller.

## 1.2 DESCRIPTION OF ONLINE HELP

Use the User Guide online help file to quickly access information regarding any MON2000 function. See Section 3.8 for more detailed information.

## 1.3 DESCRIPTION OF MON2000

MON2000 is a menu-driven, Windows-based software program designed to operate the gas chromatograph (GCs). MON2000 runs on an IBM-compatible personal computer (PC) and serves as an interface between you and the GC unit. MON2000 can run on a Windows® 95, Windows® 98, Windows® 2000, Windows® XP or Windows® NT operating system.

MON2000, combined with the GC application(s), offers a complete software package for operating and monitoring one or more GC systems from a single PC. MON2000 includes security features to help prevent unauthorized access to GC data or control. MON2000 also includes, for trouble-shooting purposes, an auxiliary program (WinMB) to selectively poll the GC Modbus registers (see Section 10 for more information).

GC functions that can be initiated or controlled by MON2000 include:

- alarm parameters
- alarm and event processing
- analog scale adjustments
- analyses
- baseline runs
- calculation assignments and configurations
- calibrations
- component assignments and configurations

**NOTICE**

**When configured for RS-485 multi-drop networking, MON2000 can interface with up to 32 GC units, either in a stand-alone configuration or via a network.**

**When configured for Ethernet networking MON2000 can interface with a number of GC Units limited only by the number of available TCP/IP addresses.**

- diagnostics
- event sequences
- halt operations
- stream assignments and sequences
- valve activations
- timing adjustments

Reports that can be generated by MON2000 per the GC application:

- 24-Hour Averages
- Analysis
- Calibration
- Final Calibration
- Hourly Averages
- Monthly Averages
- PC Configuration
- Raw Data
- Variable Averages
- Weekly Averages

Logs that are maintained by MON2000:

- Alarm Log
- Event Log
- Parameter List
- Maintenance Log

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# INSTALLATION AND SETUP

This section lists the system requirements to run MON2000 and provides installation procedures as well as initial logon instructions, communications setup, and software configuration.

## 2.1 SYSTEM REQUIREMENTS

To achieve maximum performance when running the MON2000 software, ensure your PC system contains the following hardware.

- PC with a 486/90MHz or higher processor (Pentium/100MHz or higher recommended) running either

Windows® 95 (service pack 1 or better) or later equipment and Microsoft® Windows® operating system.

**NOTICE**

**Microsoft Internet Explorer 5.0 (or later) is required to view spreadsheets or reports saved in HTML format.**

**NOTICE**

**If running Windows® 95 with the 2350A optional Ethernet card, the user must download Socket 2 from www.microsoft.com/windows95/downloads to utilize MON2000's ethernet feature.**

- Windows® 98 version 1 or later
- Windows® 2000 version 1 or later
- Windows® XP version 1 or later (see note for system requirements)
- Windows® NT Server version 4 (service pack 3 or later)

**NOTICE**

**Use the Settings > Control Panel > System/ > General Page menu to check the system version number.**

**For Windows® 95, the version number should be 4.00.950A/B or later.**

**For Windows® 98 or Windows® 2000, the version number should be 1 or later.**

**To use Windows® XP you need:**

- **Computer/Processor PC with 300 MHz or higher processor clock speed recommended;**
- **233 MHz minimum required (single or dual processor system)**
- ***Intel® Pentium®/Celeron™ family, or AMD-K6®/AMD Athlon™/AMD Duron™ family, or compatible processor recommended.**
- **Memory: 128 MB of RAM or higher recommended (64 MB minimum supported; may limit performance and some features).**
- **Hard Disk Minimum: 1.5 GB of available hard disk space.**

**For Windows® NT4, the version number should be 4.00.1381 or later.**

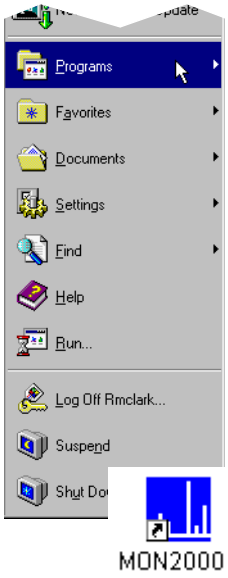
- 16 megabytes (MB) of RAM (32 MB or higher recommended)
- 5 MB of free hard disk space
- Super VGA monitor with 800x600 resolution
- free serial port for remote/local connection to gas chromatograph (for online operations)
- free parallel port for connection to printer
- Windows® -compatible modem (for remote connection only)
- Ethernet connection (when using Ethernet networking)

## 2.2 INSTALLING MON2000 SOFTWARE

To install MON2000,

**NOTICE**

**If you are upgrading MON2000, you must install the new software with same directory as the current version.**




1. Either place the MON2000 CD in your CD-ROM drive or insert Installation Disk 1 into your floppy drive.
2. Launch Windows® Explorer® by either:
   - Clicking the Start button (see the taskbar) to access the *Programs* menu option.
   - Double-clicking the Windows® Explorer® icon on your desktop.
3. Access either your CD-ROM drive or floppy drive.
4. Double-click the file “setup.exe”.
5. The Installation Wizard begins. Follow the instructions provided on each screen.

   Upon successful installation, Windows® automatically creates a MON2000 icon on your desktop.

## 2.3 COPYING MON2000 TO DISKS

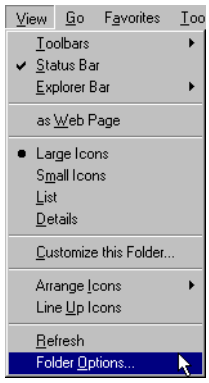
Use this procedure to copy the MON2000 installation files to 3 floppy disks for future installation.

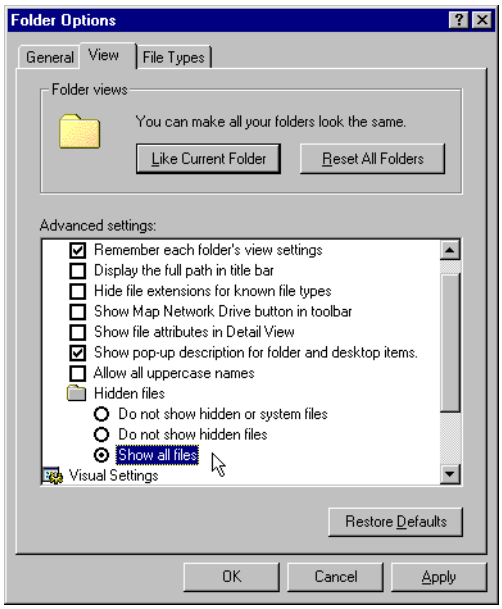
1. Label 3 blank formatted 3.5-inch floppy disks “MON2000 Install Disk 1”, “MON2000 Install Disk 2”, and “MON2000 Install Disk 3”.

2. Place the MON2000 CD in your CD-ROM drive.
3. Launch Windows® Explorer®.
4. Ensure that the *Show all files* option in Windows® Explorer® is selected.

   (a) Use the *View > Folder Options* menu to access the Folder Options dialog.

   (b) Click the *View* tab.



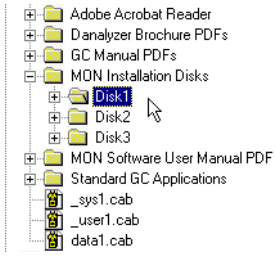




   (c) In the Advanced Settings pane, find the gray folder icon labeled *Hidden Files*.

   (d) Click the *Show all files* radio button.

   (e) Click the OK button.

5. Use the Windows® Explorer® directory tree to open the MON2000 *Installation Files* folder on your CD.



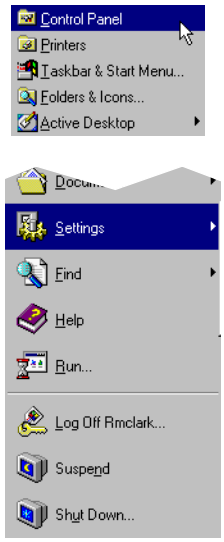

6. Place the "MON2000 Install Disk 1" in your floppy drive.
7. Open the *Disk1* folder on your CD.

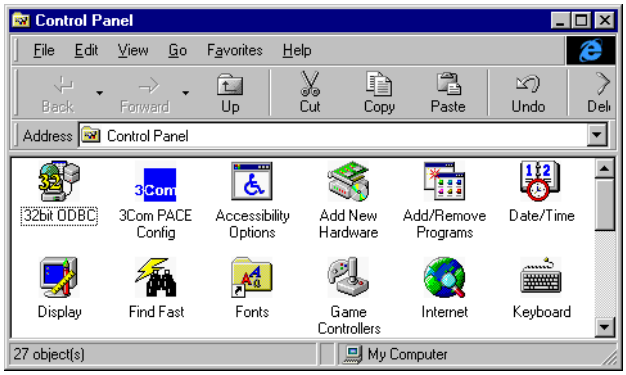
8. Copy all files from the *Disk1* folder to the "MON2000 Install Disk 1" floppy.
9. Remove the "MON2000 Install Disk 1" from your floppy drive.
10. Repeat Steps 5 through 8 to copy the *Disk2* and *Disk3* folders to your "MON2000 Install Disk 2" and "MON2000 Install Disk 3" floppy disks.
11. Remove the MON2000 CD from your CD-ROM drive.

## 2.4 UNINSTALLING MON2000

To uninstall MON2000 using Windows® 95, Windows® 98, Windows® 2000 or Windows® NT,

1. Click the Start button (see the taskbar).
2. Click *Settings* and then *Control Panel*. The Control Panel dialog appears.



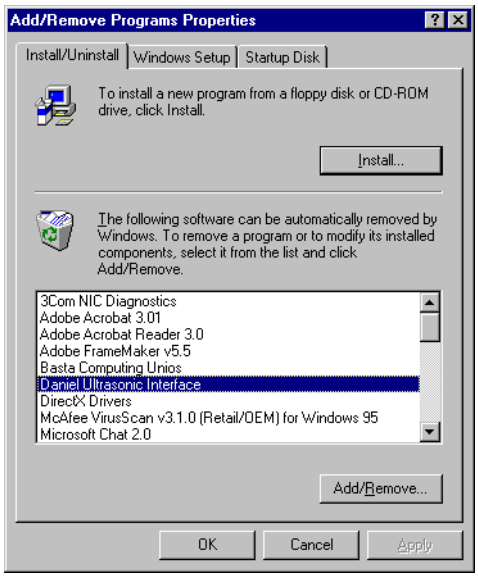




3. Double-click the *Add/Remove Programs* icon.

**NOTICE**

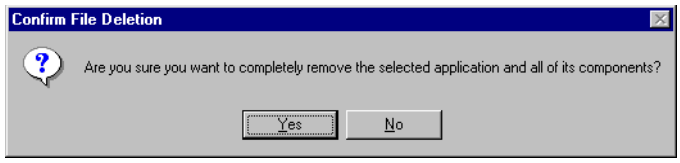
**If using Windows XP, click the Start button, then Add/Remove Programs.**

4. The Add/Remove Program Properties dialog appears.


Add/Remove Programs Properties
Install/Uninstall
Windows Setup
Startup Disk
To install a new program from a floppy disk or CD-ROM drive, click Install.
Install...
The following software can be automatically removed by Windows. To remove a program or to modify its installed components, select it from the list and click Add/Remove.
3Com NIC Diagnostics
Adobe Acrobat 3.01
Adobe Acrobat Reader 3.0
Adobe FrameMaker v5.5
Basta Computing Unios
Daniel Ultrasonic Interface
DirectX Drivers
McAfee VirusScan v3.1.0 (Retail/OEM) for Windows 95
Microsoft Chat 2.0
Add/Remove...
OK
Cancel
Apply

5. Select MON2000 and click the Add/Remove... button.

6. Windows® displays the following confirmation dialog.


Confirm File Deletion
Are you sure you want to completely remove the selected application and all of its components?
Yes
No

7. Click the Yes button to continue. Windows® deletes the program files only. Any files shared by other programs or created by the user are not deleted.

   Click the No button to abort and return to the Add/Remove Program Properties dialog.

## 2.5 STARTING MON2000

To start MON2000 after a successful installation,

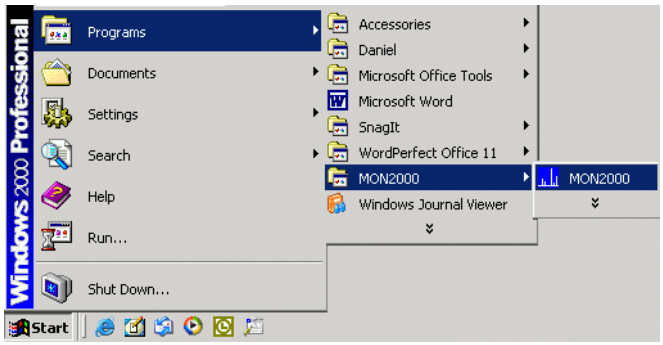
Use the Windows® Start menu (*Start* > *Programs* >*MON2000* menu) by clicking the Start button.

Double-click the MON2000 icon automatically created on your desktop during installation.

**NOTICE**

**You cannot access the MON2000 functions until you are successfully logged on.**

To start MON2000 directly from the executable file, use the directory you specified when installing MON2000. Note that **`c:\Program Files\MON2000\MON2000`** is the default setting.



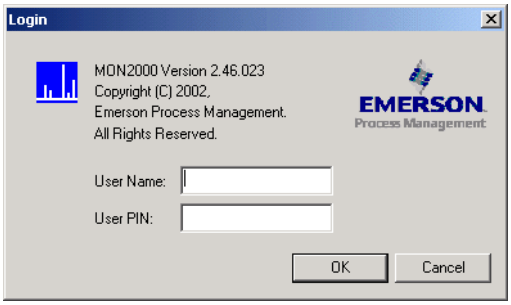
## 2.6 PERFORMING YOUR FIRST LOGON

### 2.6.1 The Initial Logon

Each new GC unit is shipped with one super user named “Emerson”. After logon, ensure that this user name appears in the Users list as a super user (see Section 2.9.1).

To log on for the first time,

1. Start the MON2000 software program by clicking the desktop icon or by using the Windows® Start menu (see Section 2.5).

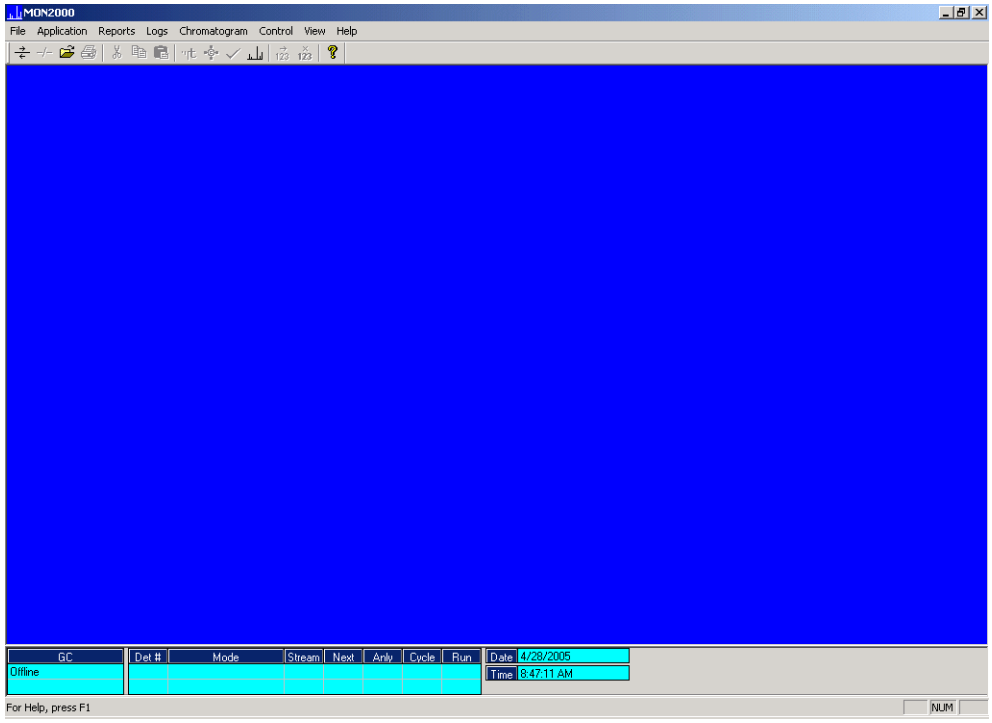



2. Click in the *User Name* data field.
3. Type **emerson**. Note that the user name is not case-sensitive.

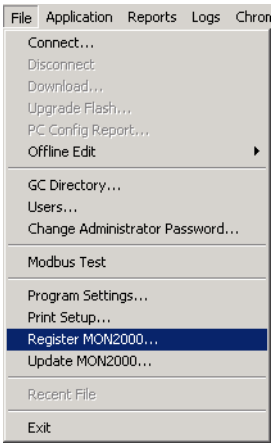
**NOTICE**

**A PIN is not required for the initial logon.**

4. When you have successfully logged on, the MON2000 main window appears.




### 2.6.2 Registering MON2000

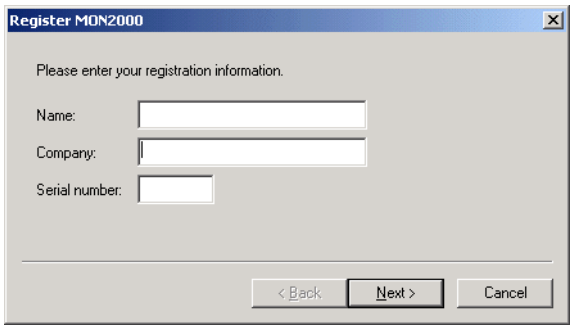



After your have successfully performed your initial logon (see Section 2.6.1), MON2000 automatically prompts you to register your copy of MON2000 software. An active Internet connection is required for registration.

Registering your MON2000 software allows you to receive information about free updates and related products. A direct link to the Emerson Internet website is provided via the *File* > *Update MON2000* menu.

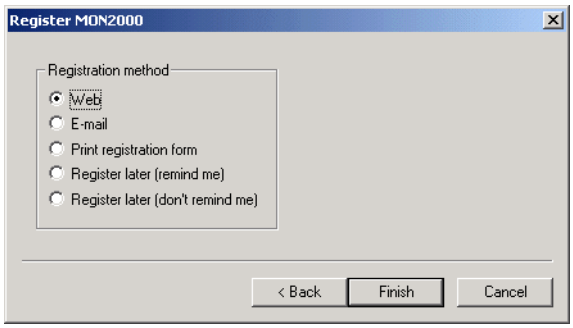
You may choose to postpone registration. You can register at any time via the *File* > *Register MON2000* menu.

1. Use the *File>Register* MON2000 menu. Follow the prompts in the Register MON2000 dialog to input your name, MON2000 serial number (located inside the CD jewel case), and other relevant information.




2. Click the Next > button to continue.

3. Choose the desired registration method by clicking the corresponding radio button.




4. Click the Finish button.

**NOTICE**

**You must have an active internet connection to register via the website.**

### 2.6.3 Update MON2000

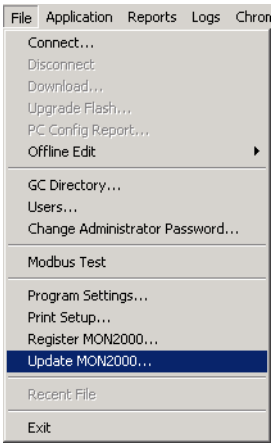
Provided there is an active internet connection to the computer on which MON2000 is installed, clicking the *File>Update MON2000* submenu sends the user to the Emerson® Chromatograph Controllers website (www.emersonprocess.com/daniel/products/GC/Controllers/Productdetail.htm).

**NOTICE**

**Updating the software requires a previously installed, registered copy of MON2000.**

Use the *File>Update MON2000* menu to download the latest versions of MON2000 and the BOS software programs.

To download the latest versions of the software,




1. Use the computer on which MON2000 is installed and connect to the Internet. Minimize the Internet window.
2. From MON2000, select the *File>Update MON2000* menu. This opens the Emerson Chromatograph Controllers website (www.emersonprocess.com/daniel/products/GC/Controllers/Productdetail.htm).
3. From the Emerson Chromatograph Controller website, you can download the latest MON2000 and BOS updates, view and/or download catalogs, brochures, equipment specification sheets, product manuals, drawings, application notes, and white papers. Other links to products and services are also available.

## 2.7 CHECKLIST FOR SETTING UP MON2000

To ensure optimum performance,

- Configure your system security (see Section 2.9.1).

  Verify that you have assigned a password to the super user, and/or created a secure system Admin account.
- Configure how MON2000 will save your analytic and diagnostic information (see Section 2.14.2).
- Establish communications between MON2000 and the GC unit (see Section 2.8 and Section 5.15).

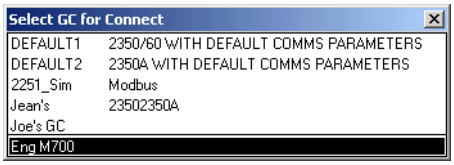
## 2.8 COMMUNICATIONS

MON2000 can communicate to the GC unit locally via a serial port cable, Ethernet connection, or remotely via a modem. If performing a remote connection, ensure that you have configured the PC modem first.

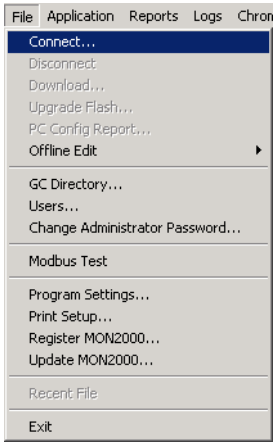
To configure the communication and serial port settings for the GC unit, see Section 5.15.

### 2.8.1 Connect to the GC Unit

1. Use the *File* > *Connect* menu or click the toolbar icon to access the Select GC for Connect menu.




2. Double-click the desired GC unit.

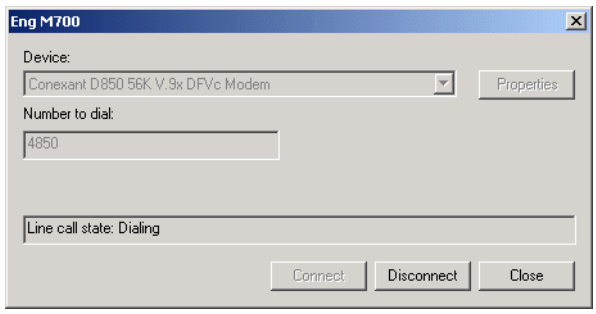


**NOTICE**

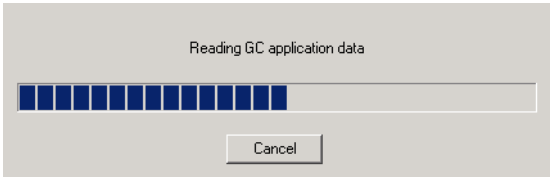
**If another user is already connected to the GC, the unit will "lock out" the second user.**

**When a PC connection is active, the GC Controller front panel will indicate a "System Lockout". This status times out after 10 minutes.**

3. MON2000 appears the connection status dialog while dialing the selected unit.



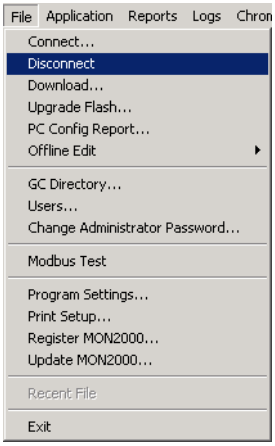

The messages "Reading dictionary", "Reading GC Application data"' and "Logon" appears in the status bar and an information screen appears.




Once connected, the name of the GC unit displays in the lower left hand corner of the MON2000 main window.

### 2.8.2 Disconnect from GC Unit

Use this process to terminate an active PC connection to a GC unit.




The menu-driven procedure for disconnecting is completely optional. MON2000 intelligently and automatically disconnects when you exit MON2000 or connect to a second GC Controller.

1. Use the *File* > *Disconnect* menu or click the toolbar –/– icon to access this function.
2. MON2000 automatically terminates all open connections.

A Terminating communications message appears in the status bar.

If MON2000 does not detect an active connection to terminate, an "Invalid selection or not downloaded" message appears.

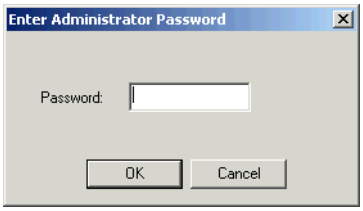
## 2.9 CUSTOMIZING MON2000

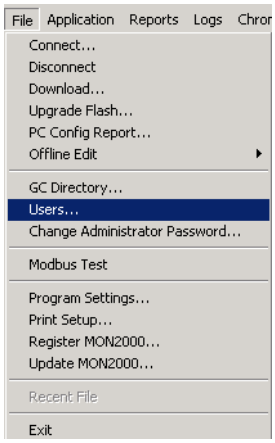
Use the following functions to customize users, the directory of GC applications, and PC communications parameters.

### 2.9.1 Configure Users

Use this function to create new user accounts or edit the existing account data. An extra level of security is assigned to the *File>Users* submenu. The *File>Users* submenu can only be accessed by first entering a Password into a dialog box titled 'Enter Administrator Password'. After gaining access to the Users dialog, the operator then has the ability to create new user accounts or edit existing account data. This feature is not available to the 'Regular' and 'Read Only' user.

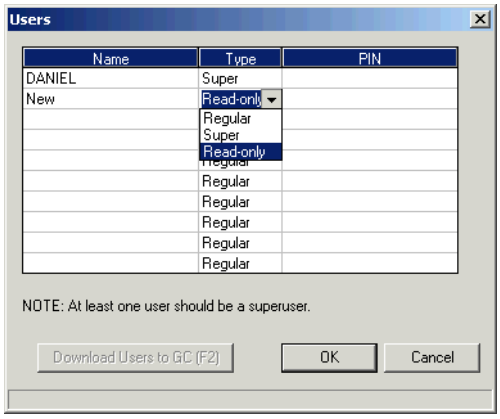
1. Use the *File* > *Users* menu to access this function.
2. The Enter Administrator Password dialog box appears.

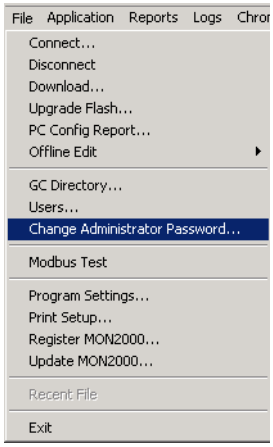


Note that the default password **admin** is not case sensitive. This password is used as a security measure to deny unauthorized users access to the MON2000 Users submenu, which allows Super users to add, edit, or change security levels.

Click the OK button. Then the Users dialog appears.




3. Use the *File>Change Administrator* menu to change the Administrator password.

   The Change Administrator Password dialog box appears.

Insert the old password, enter the new password and confirm the change.

Then, click the OK button to apply your changes.

4. To configure a new user or edit existing user parameters,

   (a) Click the appropriate *Name* cell and type the desired user name.

   Note that the user name is not case-sensitive but punctuation (e.g., commas or spaces) is preserved.

   (b) Click the appropriate *Type* cell and use the provided combo box to select the desired security level. Note that there should be at least one Super user.

   (c) Click the appropriate *PIN* cell and type the desired PIN for this user. Note that the PIN is limited to 12 numeric characters.

   If no PIN is entered, the user can log on to the MON2000 software program or the GC unit (via the front panel) with the assigned user name – that is, no password will be required.

5. To write user data to the online GC unit,

   (a) Click the Download Users to GC (F2) or press the F2 key.

   (b) MON2000 writes the data to the GC Controller.

6. Click the OK button to apply your changes and return to the main screen.

   Click the Cancel button to exit and return to the main screen without applying your changes.

**NOTICE**

**Super users can write changes to the GC unit, configure MON2000, and access the Users function.**

**Regular and Read only users can only view data.**

## 2.9.2 Set Up GC Directory

**CAUTION**

**Do not delete any currently used applications from the GC Directory. If an entry is inadvertently deleted, you may need to reinstall the application software for that GC.**

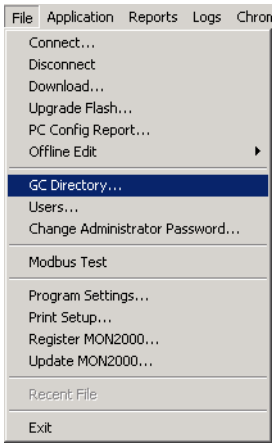
This function allows you to set up a directory listing of all GC units MON2000 can control for this application. From the GC Directory, you can configure the PC serial port communication parameters for a specific GC unit.

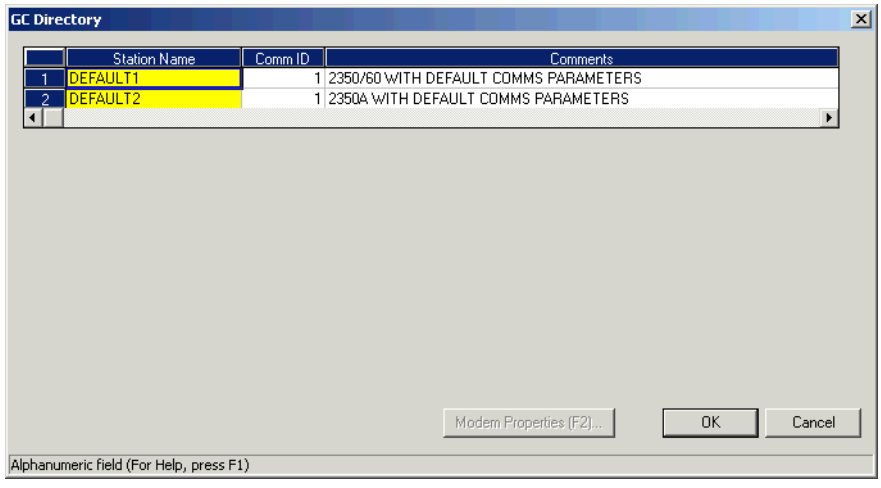
Data entered in the GC Directory is stored in the "Gcdir.dat" file (...\GC\BIN\). The Station Name is the user assigned name to a GC location. As GC applications are installed, MON2000 adds the application name to the GC Directory.

The GC unit name shown in the GC Status Bar of the MON2000 main window is entered via the System dialog (see Section 5.1).

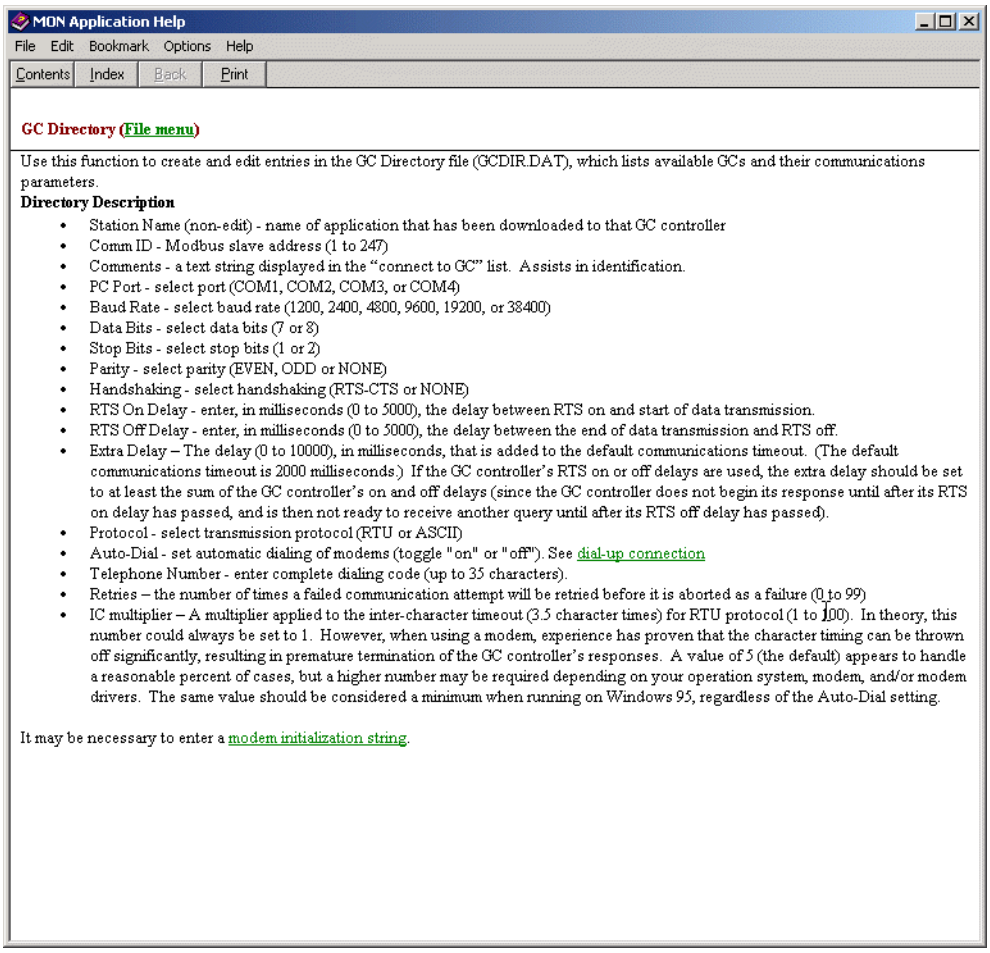
To edit the GC directory,

1. Use the *File* > *GC Directory* menu to access this function.
2. The GC Directory dialog appears.



3. Press the F1 key to open the MON2000 Application help file for detailed information about these settings.


MON Application Help
File Edit Bookmark Options Help
Contents Index Back Print
GC Directory (File menu)
Use this function to create and edit entries in the GC Directory file (GCDIR.DAT), which lists available GCs and their communications parameters.
Directory Description
Station Name (non-edit) - name of application that has been downloaded to that GC controller
Comm ID - Modbus slave address (1 to 247)
Comments - a text string displayed in the "connect to GC" list. Assists in identification.
PC Port - select port (COM1, COM2, COM3, or COM4)
Baud Rate - select baud rate (1200, 2400, 4800, 9600, 19200, or 38400)
Data Bits - select data bits (7 or 8)
Stop Bits - select stop bits (1 or 2)
Parity - select parity (EVEN, ODD or NONE)
Handshaking - select handshaking (RTS-CTS or NONE)
RTS On Delay - enter, in milliseconds (0 to 5000), the delay between RTS on and start of data transmission.
RTS Off Delay - enter, in milliseconds (0 to 5000), the delay between the end of data transmission and RTS off.
Extra Delay – The delay (0 to 10000), in milliseconds, that is added to the default communications timeout. (The default communications timeout is 2000 milliseconds.) If the GC controller's RTS on or off delays are used, the extra delay should be set to at least the sum of the GC controller's on and off delays (since the GC controller does not begin its response until after its RTS on delay has passed, and is then not ready to receive another query until after its RTS off delay has passed).
Protocol - select transmission protocol (RTU or ASCII)
Auto-Dial - set automatic dialing of modems (toggle "on" or "off"). See dial-up connection
Telephone Number - enter complete dialing code (up to 35 characters).
Retries – the number of times a failed communication attempt will be retried before it is aborted as a failure (0 to 99)
IC multiplier – A multiplier applied to the inter-character timeout (3.5 character times) for RTU protocol (1 to 100). In theory, this number could always be set to 1. However, when using a modem, experience has proven that the character timing can be thrown off significantly, resulting in premature termination of the GC controller's responses. A value of 5 (the default) appears to handle a reasonable percent of cases, but a higher number may be required depending on your operation system, modem, and/or modem drivers. The same value should be considered a minimum when running on Windows 95, regardless of the Auto-Dial setting.
It may be necessary to enter a modem initialization string.

4. MON2000 is configured with two default directories:
   - Default 1: parameters are set for 9600 baud rate
5. Default 2: parameters are set for 19200 baud rate.
6. Click the appropriate *Com ID* cell and type the Modbus communication identification number (set by DIP switch positions on the

GC Controller system interface board) for the GC unit.

To successfully connect to the GC unit, the COM IDs specified via the *File>GC Directory* and the *Application>Serial Ports* dialogs must match. See Section 5.15.1 for more information.

7. Click the *Comments* cell to enter any helpful information regarding a particular GC unit, such as location or purpose.
8. Use the dynamic pull-down menus to select the desired *PC Port*, *Baud Rate*, *Data Bits*, *Stop Bits*, *Parity*, and *Handshaking* settings.

**NOTICE**

**The following parameters support an auto-detect setting: Baud Rate, Data Bits, Stop Bits, Parity, Protocol.**

**Set any of these parameters to "?" (autodetect) and MON2000 will conform to the settings used by the GC unit.**

9. Use the provided cells to input *RTS On Delay*, *RTS Off Delay*, and *Extra Delay* values.

   The *Extra Delay* field accepts numerical values (0 to 9000 milliseconds) for additional time to be added to the current communication timeout delay.
10. Use the *Protocol* pull-down menu to select the desired Modbus communications protocol.
11. If you plan to connect remotely to the GC unit via a modem or Ethernet connection, use the *Connection Type (Direct/Remote)* pull-down menu for a "Direct Connect" option or a previously configured modem.

### 2.9.3 Dial-up Connection

Use this command to run the Dial-up dialog to configure the GC Controller modem. The default properties from Windows® Control Panel are used so you must ensure that the modem connects at the GC Controller's configured baud rate. It may be necessary to enter a modem initialization string.

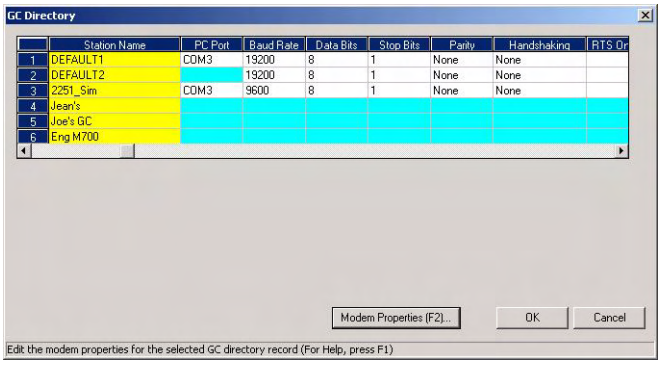
**NOTICE**

**The Direct Connect option allows you to connect from the PC to the GC Controller via a serial port, per its default settings.**

**If you select a modem, the modem property dialog appears, allowing you to change its attributes.**

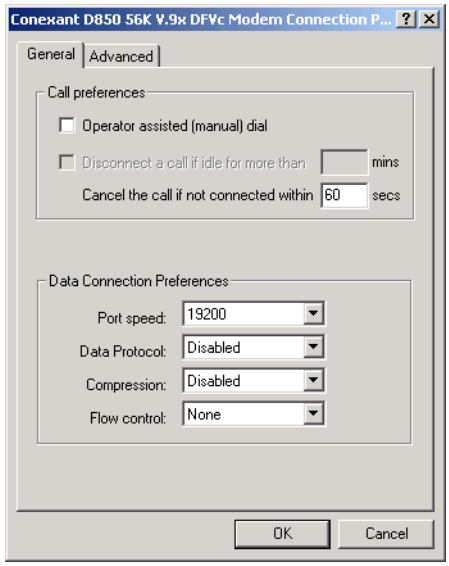
To configure the modem and make a connection,

1. Use the *File>GC Directory* menu, and the GC Directory appears.




2. Click the **Station Name** data field and click the **Modem Properties** button or press the **F2** button.

3. The Modem Properties dialog appears and the **General Data Connection Modem Preferences** are activated.

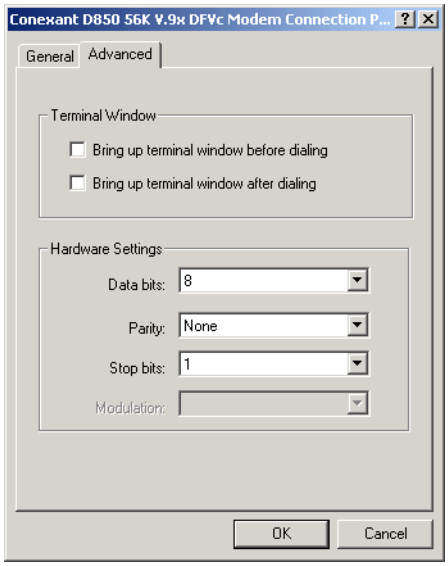



The General Data default settings are:

*Table 2-1 General Data Connection Preferences*

| | |
|---|---|
| **Port Speed** | 19200 |
| **Data Protocol** | Disabled |
| **Compression** | Disabled |
| **Flow Control** | None |

4. Click the Advanced tab to configure the Hardware settings.




The Advanced Data default settings are:

*Table 2-2 Advanced Data Connection Preferences*

| | |
|---|---|
| **Data Bits** | 8 |
| **Parity** | None |
| **Stop Bits** | 1 |

5. Click the OK button to apply your changes, or click the Cancel button to discard the changes and return to the GC Directory dialog.

6. Next, from the *GC Directory* dialog, scroll over to configure the following parameters:

**NOTICE**

**The Baud Rate, Data Bits, and Stop Bits parameters were configured above.**

*Table 2-3 GC Directory Dialog Default Settings*

| **Heading** | **Pull-down Menu Selection** |
|---|---|
| PC Port | COM1, COM2,COM3 |
| Handshaking | None |
| RTS On Delay | 0 |
| RTS On Delay | 0 |
| Extra Delay | 0 (**See note**) |
| Connection Type (Direct/Remote) | Direct Connection<br>Modem |
| Telephone | Complete number<br>(Area Code) (XXX-XXXX) |
| Server Type -<br>IP Address | XXX.XX.XX.XXX<br>(10 digits) |
| Retries<br>• Modem<br>• IP Address | <br>5<br>3 |
| IC Multiplier | 10 |

**NOTICE**

**The Extra Delay is enabled for Ethernet connections.**

**The default value is "0" and the default 30 seconds timeout is used. If the value is changed to greater than "0", the value is used as the timeout. The entered value is multiplied by 10 inside MON2000, therefore the maximum timeout is 100,000 ms or 100 seconds (ex: If timeout value needs to be 15 seconds, the user should enter 1,500).**

7. Click the OK button to accept the changes. While connecting, MON2000 dials the number, attempts to connect via the selected modem and displays progress messages. A message box appears when a connection has been made or if the attempt to connect fails.

   Once a connection has been established and while MON2000 remains connected via the modem, the **Connect** button is disabled and the **Disconnect** button is enabled.

   If the connection fails at any time, MON2000 displays a message in the GC Status bar that it has been disconnected. You can end the connection from the *File>Disconnect* menu, by clicking the disconnect icon on the MON2000 toolbar, or by exiting MON2000.

**NOTICE**

**If you are using the Modbus RTU protocol, the values for baud rate, data bits, stop bits, and parity must match the settings you configured in the Modem Properties dialog.**

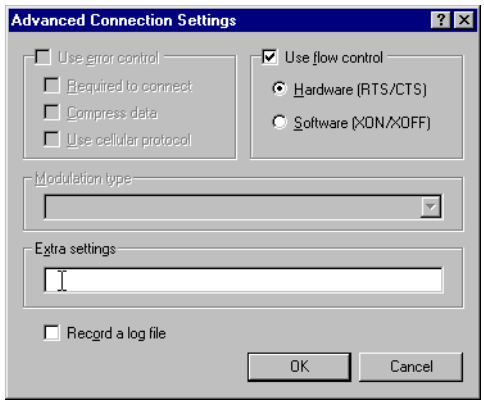
**These values are required to correctly calculate character timing.**

   When you start MON2000 after the parameters are established, you can connect to the GC via the *File>Connect* menu or by clicking the **Connection** icon on the MON2000 toolbar.

### 2.9.4 Modem Initialization Strings/Setup

This section provides “examples” of modem initialization strings and setups that have been tested and proven operable. This string of text characters, known as 'AT commands', has special meaning to the PC modem and is used by the modem for every telephone connection made to a selected GC unit.

To edit or enter a modem initialization string, use the Start button and use the *Control Panel* > *Modems* > *General* > *Properties* > *Connection* > *Advanced* to access the Advanced Modem Connection Settings dialog. Enter the modem initialization string in the Extra Settings field.



By default, MON2000 provides a modem initialization string that serves the purpose for most Hayes-compatible modems. Therefore, in most cases, you need not enter a different string.

However, for some modems, you may want to consult the following pages which document initialization strings and modem setups that have been field-tested.

**NOTICE**

**The default initialization string that MON2000 provides is sent to the PC modem first. Then the custom initialization string you provide is sent. In this manner, MON2000 sets the modem parameters that it requires, while you can customize the modem's operation to respond to special conditions.**

**Once the optimum modem initialization string has been determined, it should need no further revision unless a different brand or model of modem is installed.**

### Black Box - Modem 325

During development of the GC Controller, a Black Box Modem 325 was used to test modem communications with the GC unit. For that test and that modem, the modem initialization was set as follows:

\N0\C0\Q0 (where 0 = zero)

Interpretation of the AT commands for that particular modem was as follows:

- \N0 = normal mode; no error control; data is buffered (versus 'direct mode,' 'reliable mode, 'or 'auto reliable mode')
- \C0 = disable auto reliable buffer (versus 'buffer data for 4 seconds or 200 characters')
- \Q0 = disable flow control (versus 'enable XON/XOFF flow control,' 'enable unilateral CTS flow control,' or 'enable bilateral CTS/ RTS flow control')

#### U.S. Robotics Sportster

The following setup for U.S. Robotics Sportster 28.8 Kbps external FAX-modems was verified at the GC assembly and checkout lab:

- At the GC Controller, the modem DIP switches were set to 5 and 8 UP, the rest DOWN.
- At the PC, the modem DIP switches were set to 2, 4, 6, and 7 UP, the rest DOWN.

With these switch settings, initialization string &F was required. See Table 2-4 for further explanation of these switch settings and the parameters they control.

*Table 2-4 DIP Switch Settings for U.S. Robotics Sportster Modem*

| Switch | Function | At GC | At PC |
|---|---|---|---|
| 1 | UP (off) – Normal DTR; computer must provide DTR signal for modem to accept commands. | | |
| | DOWN (on) – Modem ignores DTR. | ✓ | ✓ |
| 2 | UP (off) – Verbal (word) results. | | ✓ |
| | DOWN (on) – Numeric results. | ✓ | |
| 3 | UP (off) – Suppress result codes. | | |
| | DOWN (on) – Enable result codes. | ✓ | ✓ |
| 4 | UP (off) – Display keyboard commands. | | ✓ |
| | DOWN (on) – Suppress echo. | ✓ | |
| 5 | UP (off) – Modem answers on first ring or higher. | ✓ | |
| | DOWN (on) – Disable auto answer. | | ✓ |
| 6 | UP (off) – Modem sends carrier detect (CD) signal on connect, and drops CD on disconnect. | | ✓ |
| | DOWN (on) – CD always on. | ✓ | |
| 7 | UP (off) – For power-on and ATZ reset, the Y or Y1 configuration is used from user-defined nonvolatile memory (NVRAM). | | ✓ |
| | DOWN (on) – For power-on and ATZ reset, the generic template, &F0, is used from read only memory (ROM). | ✓ | |
| 8 | UP (off) – Disable AT command set recognition. | ✓ | |
| | DOWN (on) – Enable AT command set recognition. | | ✓ |

### GVC/MaxTech 28.8 Kbps Modem

The following setup for GVC 28.8 Kbps external Voice/Data/FAX modems was verified at Daniel Canada. At the GC Controller:

**NOTICE**

**To make these settings for the modem at the GC Controller, you will need to use a terminal program (such as ProComm o other commercial modem software) to input the "AT" commands to the modem before connecting it to the GC Controller.**

| | |
|---|---|
| AT&F5 | Factory default with v.42bis flow control disabled (must be first). |
| ATB8 | 9600 baud |

Or

| | |
|---|---|
| ATB11 | 19200 baud |
| AT&D0 | Modem ignores DTR (not necessary if using a cable that incorporates the DTR signal from the Controller). |
| ATM0 | Turn OFF speaker. |
| ATS0=n | n is number of rings for auto answer (e.g., ATS0=1, ATS0=2, etc.). |
| AT&C0 | Force carrier detect high |
| AT%C0 | Turn OFF compression. |

**NOTICE**

**If compression is turned ON with AT%C1, or OFF with AT%C0, then the modem at other end should match.**

| | |
|---|---|
| AT&W0 | Write to stored profile "0" (zero). |
| AT&Y0 | Use stored profile "0" (zero) when turned on. |

At the PC, use &F5%C1M0 which indicates a factory default with v.42bis flow control disabled / compression ON / speaker OFF.

## 2.10 2350 TO 2350A RETROFIT INSTRUCTIONS

The 2350A GC Controller CPU assembly has been designed to include all digital I/O and COM3 and COM4 serial ports. This eliminates the requirement (and additional cost) for an I/O assembly or DSPI/O assembly.

In addition, BOS is now resident in the DiskOnChip, instead of an EPROM set. The DiskOnChip provides additional expanded memory for archiving data, instead of having to purchase a memory expansion board assembly. The BOS file in the DiskOnChip may be upgraded in the field through the MON2000 Software.

Optional boards may be plugged directly into the PC/104 Bus (connectors J19 and J20) on the CPU Board assembly. The COM4A Board provides four additional serial ports (COM5 through COM8). A Modem Board and/or Ethernet Board may be also be plugged directly into the PC/104 Bus for additional communications requirements.

The PC/104 Bus is designed to allow any combination of option boards to be installed in any order, with the exception of the CSA approved Radicom modem board which must be the top board in the assembly. (see Figure 2-1).

*Figure 2-1 2350A Controller Card Cage Assembly*

**NOTICE**

**If you are using the CSA approved Radicom modem; ensure that it is the top card in the card cage assembly. The connection configuration of the Radicom modem requires installation at the top of the assembly.**

## 2.11 CONVERSION PROCESS

Use the following process to retrofit a 2350 GC Controller to a 2350A GC Controller.

1. At the GC Controller site, remove the Controller enclosure's front panel.

**⚠WARNING**

**SERIOUS PERSONAL INJURY OR DEATH POSSIBLE**

**Before removing the unit cover from the GC Controller, make certain the power supply switch is OFF and the AC power cord is disconnected. Observe all safety precautions when you are working in a hazardous environment.**

Failure to observe all safety precautions could result in serious injury or death.

   (a) For the explosion-proof Controller, the front panel is secured by 16 screws. Remove those screws first.

   (b) Then carefully lower the front panel on its bottom hinges. The front panel is heavy, so make sure it does not drop and cause damage.

   (c) For the rack mount Controller, the rear of the enclosure is open; it allows access for most field wiring procedures without removing the enclosure.

2. Locate the GC Controller's Terminal Board for Field Wiring (TB). The TB is attached to the GC Controller's card cage assembly, facing the enclosure's front panel. (In the rack mount Controller, the TB faces outward toward the rear of the enclosure.)

3. Loosen the six screws that secure the TB. Then unplug the TB from its connections at the back, top of the board.

4. Lower the TB down and out of the way, held in place by its ground straps at the bottom of the board. This exposes the Card Cage Assembly.
5. Loosen the four screws that secure the Card Cage Assembly to the chassis. Then remove the Card Cage Assembly away from its chassis mount so that it is easy to work on.
6. Locate the System Interface and Driver board. It is mounted to the top of the Card Cage Assembly.
7. Remove all cables connected to the System Interface Board (P/N 3-2350-005, P/N 3-2350-022, or P/N 3-2350-023).
8. Remove the I/O48 Board assembly (drawing P/N BE-12973) and cables from the top slot of the Cage Card Assembly. This board is not used on the 2350A GC Controller.
9. Remove the CPU Board assembly (P/N CE-19281) and cables from the second slot of the card cage assembly. This board is not used on the 2350A GC Controller.

10. Remove the DSPI/O board assembly (drawing P/N CE-12976) and cables from the third slot of the card cage assembly. This board is not used on the 2350A GC Controller.
11. Remove any other optional boards, such as memory expansion boards and associated cables. These parts are not used on the 2350A GC Controller.
12. Leave the Analog Board assembly (drawing P/N BE-18044) with attached cable in the card cage. This board is used on the 2350A basic configuration.
13. Change the fuse in the in-line fuse holder from 1 amp to the 2.5 amp, Slo-Blo fuse provided. The fuse is located in the cable (P/N 2-3-2350-069) between the power supply and the System Interface Board.
14. Ensure that DIP Switches 6, 7, and 8 of S1 are all in the "OFF" position. If the 2350A is powered up with S8 in the OFF position, it will delete the current application (commonly called a "Cold Start").
15. To inspect or change the GC Controller's COM ID setup at the GC Controller site, locate the DIP switch as described in the following steps.

**SERIOUS PERSONAL INJURY OR DEATH POSSIBLE**

**Before removing the unit cover from the GC Controller, make certain the power supply switch is OFF and the AC power cord is disconnected. Observe all safety precautions when you are working in a hazardous environment.**

Failure to observe all safety precautions could result in serious injury or death.

16. For the explosion-proof Controller, the front panel is secured by 16 screws. Remove those screws first.

    (a) Then carefully lower the front panel on its bottom hinges. The front panel is heavy, so make sure it does not drop and cause damage. The DIP switch is located on the lower left side of the front panel (see Figure G-2).

*Figure 2-2 Explosion-Proof Controller Dip Switch*

17. For rack mount and panel mount Controllers, use a flat head screw driver to remove the access panel on the right side of the card cage assembly (see Figure 2-3).

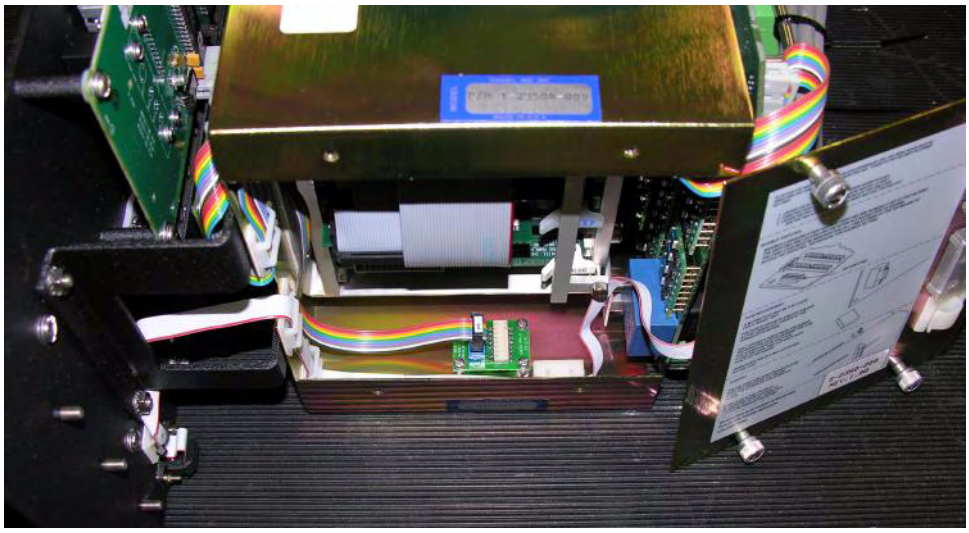


*Figure 2-3 Right Side View Rack and Panel Mount Units*

18. Inspect or change the DIP switch settings as necessary.

    (a) See Table 2-5 as a guide.

    (b) Make sure you record in the GC Controller's maintenance records any changes you make to the switch settings.

- Switches "1" through "5" form a 5-bit binary number for setting the Modbus slave address (also known as COM ID or Device ID.)
- Switch number "1" is the least significant bit, and switch number "5" is the most significant bit.

  Switch to ON = 1

  Switch to OFF = 0

- Switch "6" is a spare for future use. Switches "7" and "8" are set as needed for the presence of an optional LOI (Local Operator Interface) connected via COM8 When the COM4A Board is installed. If the COM4A Board is not installed, the LOI is connected via COM4.

*Table 2-5 Dip Switch Settings Switch Positions*

| COM ID | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| 1 | ON | OFF | OFF | OFF | OFF |
| 2 | OFF | ON | OFF | OFF | OFF |
| 3 | ON | ON | OFF | OFF | OFF |
| 4 | OFF | OFF | ON | OFF | OFF |
| 5 | ON | OFF | ON | OFF | OFF |
| 6 | OFF | ON | ON | OFF | OFF |
| 7 | ON | ON | ON | OFF | OFF |
| 8 | OFF | OFF | OFF | ON | OFF |

| **RAM CLEAR** | |
|---|---|
| **Dip Switch Setting Positions** | |
| | 8 |
| Clears RAM when unit is powered down | ON |
| Keeps RAM data when unit is powered down | OFF |

## 2.12 BASIC 2350A CONFIGURATION

At this point, install, if any, all mounting hardware and optional PC/104 boards onto the 2350A CPU Board.

1. Install the 2350A CPU (P/N 3-2350-090) into slot 3 of the card cage assembly.
2. Install cables on the CPU Board in the following sequence:
   (a) Digital I/O cable (P/N 3-2350-081) from CPU J7 to the System Interface Board J2.
   (b) Digital I/O cable (P/N 3-2350-080) from CPU J4 to the System Interface Board J3.
   (c) COM1, COM2, and the printer cable (P/N 3-2350-083) from CPU J1 to the System Interface Board J4, J9, and J11.
   (d) COM3 and COM4 can be configured two different ways. To configure a system WITHOUT a keyboard and display, connect cable (P/N 3-2350-084) from CPU J6 to the System Interface Board J8 and J10. This provides access to COM3 on J10 and COM4 on J11 of the Field Termination board. The serial port setup in the MON2000 Software for COM4 must be selected as a PC port.
   (e) For a system WITH a keyboard and display, connect cable (P/N 3-2350-087) from CPU J6 to the System Interface J8 and J12. This provides access to COM3 on J10 and COM4 is dedicated for use as a serial interface to the keyboard and display. COM4 will not be available at J11 of the Field Termination board.

The serial port setup in the MON2000 Software for COM4 must be selected as Front Panel (see Figure 2-4). If all four serial ports are required for communications on a system with keyboard and display, an optional COM4A Board must be installed and a COM7 and COM8 cable (P/N 3-2350-086) connected (see Figure 2-5). The serial port setup in the MON2000 Software for COM8 must be configured as Front Panel. See Figure G-4b.

(f) Reinstall the Analog cable to J6 on the System Interface Board.

(g) Place the "Unit Updated to 2350A" label, included with the upgrade kit, on the instruction decal located on the inside, right wall of the explosion-proof units or on the card cage of the rack or panel mount units.

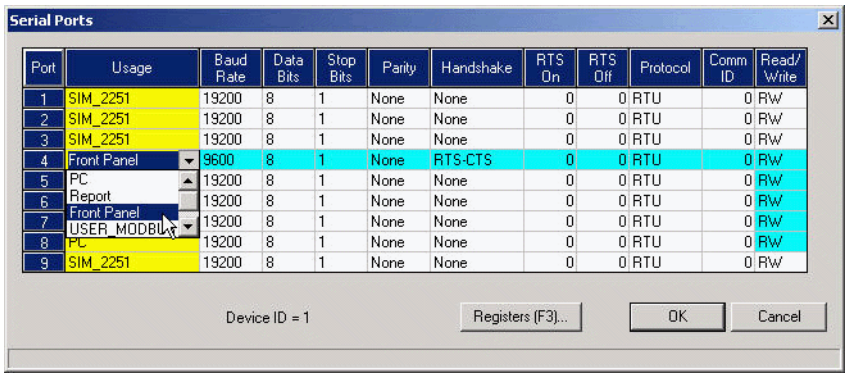

Serial Ports
Port
Usage
Baud Rate
Data Bits
Stop Bits
Parity
Handshake
RTS On
RTS Off
Protocol
Comm ID
Read/ Write
1 SIM_2251 19200 8 1 None None 0 0 RTU 0 RW
2 SIM_2251 19200 8 1 None None 0 0 RTU 0 RW
3 SIM_2251 19200 8 1 None None 0 0 RTU 0 RW
4 Front Panel 9600 8 1 None RTS-CTS 0 0 RTU 0 RW
5 PC 19200 8 1 None None 0 0 RTU 0 RW
6 Report 19200 8 1 None None 0 0 RTU 0 RW
7 Front Panel 19200 8 1 None None 0 0 RTU 0 RW
8 USER_MODBUS 19200 8 1 None None 0 0 RTU 0 RW
9 SIM_2251 19200 8 1 None None 0 0 RTU 0 RW
Device ID = 1
Registers (F3)...
OK
Cancel

*Figure 2-4 Serial Port 4 with COM4A Board*

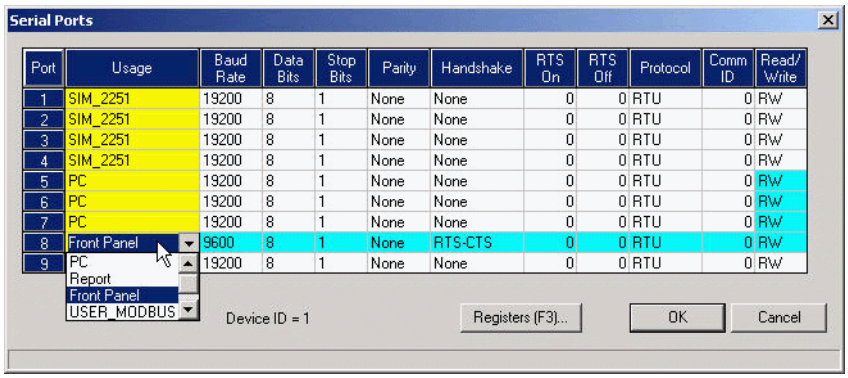

Serial Ports
Port
Usage
Baud Rate
Data Bits
Stop Bits
Parity
Handshake
RTS On
RTS Off
Protocol
Comm ID
Read/ Write
1 SIM_2251 19200 8 1 None None 0 0 RTU 0 RW
2 SIM_2251 19200 8 1 None None 0 0 RTU 0 RW
3 SIM_2251 19200 8 1 None None 0 0 RTU 0 RW
4 SIM_2251 19200 8 1 None None 0 0 RTU 0 RW
5 PC 19200 8 1 None None 0 0 RTU 0 RW
6 PC 19200 8 1 None None 0 0 RTU 0 RW
7 PC 19200 8 1 None None 0 0 RTU 0 RW
8 Front Panel 9600 8 1 None RTS-CTS 0 0 RTU 0 RW
9 PC 19200 8 1 None None 0 0 RTU 0 RW
Report
Front Panel
USER_MODBUS
Device ID = 1
Registers (F3)...
OK
Cancel

*Figure 2-5 Serial Port 8 with COM4A Board*

## 2.13 2350A OPTIONS

The following board configurations are optional for the Model 500 GC with 2350A Controller.

### 2.13.1 The COM4A Board

1. To add four additional communications ports at the GC Controller site, remove the Controller enclosure's front panel.

**⚠WARNING**

**SERIOUS PERSONAL INJURY OR DEATH POSSIBLE**

**Before removing the unit cover from the GC Controller, make certain the power supply switch is OFF and the AC power cord is disconnected. Observe all safety precautions when you are working in a hazardous environment.**

Failure to observe all safety precautions could result in serious injury or death.

   (a) For the explosion-proof Controller, the front panel is secured by 16 screws. Remove those screws first.

   (b) Then carefully lower the front panel on its bottom hinges. The front panel is heavy, so make sure it does not drop and cause damage.

   (c) For the rack mount Controller, the rear of the enclosure is open; it allows access for most field wiring procedures without removing the enclosure.

2. Locate the GC Controller's Terminal Board for Field Wiring (TB). The TB is attached to the GC Controller's Card Cage Assembly, facing the enclosure's front panel. (In the rack mount Controller, the TB faces outward toward the rear of the enclosure.)

3. Loosen the six screws that secure the TB. Then unplug the TB from its connections at the back, top of the board.

4. Lower the TB down and out of the way, held in place by its ground straps at the bottom of the board. This exposes the Card Cage Assembly.
5. Loosen the four screws that secure the Card Cage Assembly to the chassis. Then remove the Card Cage Assembly away from its chassis mount so that it is easy to work on.
6. Locate the System Interface and Driver board. It is mounted to the top of the Card Cage Assembly.
   (a) Disconnect the Analog cable from J6 on the System Interface Board, then disconnect all CPU cables from the System Interface Board.
   (b) Remove the CPU assembly and install the COM4A Board, with associated mounting hardware to J19 and J20 PC/104 Bus connector on the CPU assembly.
   (c) Connect COM5 (P22) and COM6 (P23) on the Field Termination board via cable (P/N 3-2350-085) to J6 on COM4A.
   (d) Connect COM7 (P24) on the Field Termination board and COM8 via cable (P/N 3-2350-086) to J3 on COM4A.
   (e) Install the CPU assembly into the third slot of card cage. Connect the CPU cables as detailed in Section 6.3 Basic 2350A Configuration.
   (f) Install the DB9 connector from COM5 to P22 on the Field Termination board with jackpost assemblies.
   (g) Install the DB9 connector from COM6 to P23 on the Field Termination board with jackpost assemblies.
   (h) Install the DB9 connector from COM7 to P24 on the Field Termination board with jackpost assemblies.

(i) Install the ten position connector from COM8 to J12 on the System Interface Board.

(j) Connect the Analog cable to J6 on the System Interface Board.

With COM4A Boards installed, Serial Port 8 is usually assigned via MON2000 Application>Serial Ports menu. Select Front Panel from the Usage pull-down menu (see Figure 2-6 and Figure 2-7).

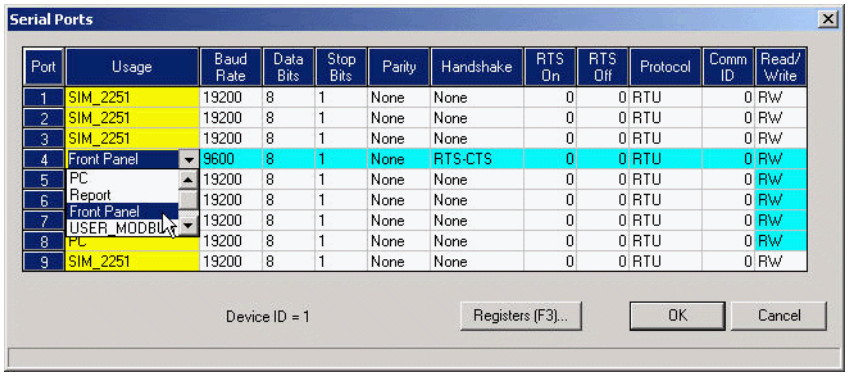

Serial Ports
Port
Usage
Baud Rate
Data Bits
Stop Bits
Parity
Handshake
RTS On
RTS Off
Protocol
Comm ID
Read/ Write
1 SIM_2251 19200 8 1 None None 0 0 RTU 0 RW
2 SIM_2251 19200 8 1 None None 0 0 RTU 0 RW
3 SIM_2251 19200 8 1 None None 0 0 RTU 0 RW
4 Front Panel 9600 8 1 None RTS-CTS 0 0 RTU 0 RW
5 PC 19200 8 1 None None 0 0 RTU 0 RW
6 Report 19200 8 1 None None 0 0 RTU 0 RW
7 Front Panel 19200 8 1 None None 0 0 RTU 0 RW
8 USER_MODBUS 19200 8 1 None None 0 0 RTU 0 RW
9 SIM_2251 19200 8 1 None None 0 0 RTU 0 RW
Device ID = 1
Registers (F3)...
OK
Cancel

*Figure 2-6 Serial Port 4 with COM4A Board*

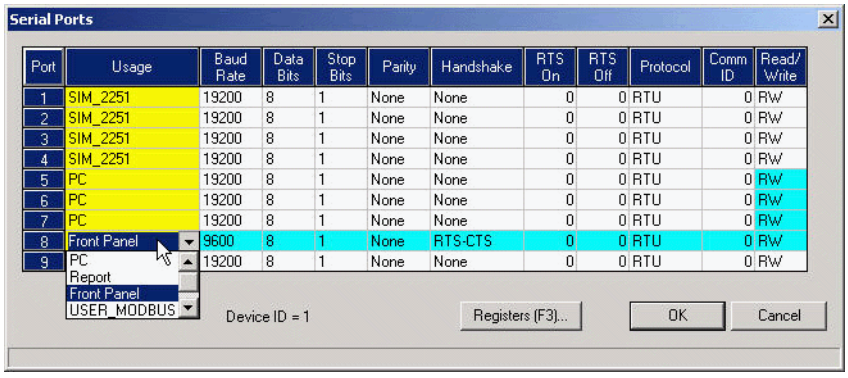

Serial Ports
Port
Usage
Baud Rate
Data Bits
Stop Bits
Parity
Handshake
RTS On
RTS Off
Protocol
Comm ID
Read/ Write
1 SIM_2251 19200 8 1 None None 0 0 RTU 0 RW
2 SIM_2251 19200 8 1 None None 0 0 RTU 0 RW
3 SIM_2251 19200 8 1 None None 0 0 RTU 0 RW
4 SIM_2251 19200 8 1 None None 0 0 RTU 0 RW
5 PC 19200 8 1 None None 0 0 RTU 0 RW
6 PC 19200 8 1 None None 0 0 RTU 0 RW
7 PC 19200 8 1 None None 0 0 RTU 0 RW
8 Front Panel 9600 8 1 None RTS-CTS 0 0 RTU 0 RW
9 PC 19200 8 1 None None 0 0 RTU 0 RW
Report
Front Panel
USER_MODBUS
Device ID = 1
Registers (F3)...
OK
Cancel

*Figure 2-7 Serial Port 8 with COM4A Board*

### 2.13.2 2350A Modem Installation

To install the Internal Modem for the 2350A GC Controller, follow these steps:

**NOTICE**

**Refer to P/N 3-9000-537 2350A GC Hardware manual for COM settings and pinouts.**

1. To add a modem, at the GC Controller site, remove the Controller enclosure's front panel.
   (a) For the explosion-proof Controller, the front panel is secured by 16 screws. Remove those screws first.
   (b) Then carefully lower the front panel on its bottom hinges. The front panel is heavy, so make sure it does not drop and cause damage.
   (c) For the rack mount Controller, the rear of the enclosure is open; it allows access for most field wiring procedures without removing the enclosure.
2. Locate the GC Controller's Terminal Board for Field Wiring (TB). The TB is attached to the GC Controller's Card Cage Assembly, facing the enclosure's front panel. (In the rack mount Controller, the TB faces outward toward the rear of the enclosure.)
3. Loosen the six screws that secure the TB. Then unplug the TB from its connections at the back, top of the board.
4. Lower the TB down and out of the way, held in place by its ground straps at the bottom of the board. This exposes the Card Cage Assembly.

5. Loosen the four screws that secure the Card Cage Assembly to the chassis. Then remove the Card Cage Assembly away from its chassis mount so that it is easy to work on.
6. Locate the System Interface and Driver board. It is mounted to the top of the Card Cage Assembly.
   (a) Disconnect the Analog cable from J6 on the System Interface Board, then disconnect all CPU cables from the System Interface Board.
   (b) Remove the CPU assembly and install the COM4A Board, with associated mounting hardware to J19 and J20 PC/104 Bus connector on the CPU assembly.

**NOTICE**

**If an option board is already plugged into the PC/104 bus on the CPU, the modem and mounting hardware will be installed into the PC/104 connector on the option board.**

*Figure 2-8 Modem Piggy-backed on CPU Board*

(c) Plug one end of the modem extension cable (P/N 3-2350-075) into J1 of the modem assembly. The in-line jack on the remaining end of the modem extension cable attaches to the lower left inside wall of the card cage shield (after the CPU assembly is reinstalled and all cables reconnected to the System Interface board). No software setup is required for this board.

7. To use an existing Modem (1414):

   (a) For operation with the 2350A CPU, set the Standard 1414 Modem jumpers per the following table:

*Table 2-6 1414 (Standard) Modem Jumper Settings*

| Jumper | Pin |
|---|---|
| J4/J5 | Open |
| J6 | 3-5, 4-6 |
| J7 | 7-8 |
| J9 | Open |

   (b) On the 2350A WinSystems CPU, set J21, pin 13-14.

### 2.13.3 2350A Ethernet Installation

To add an Ethernet assembly:

1. To add a modem, at the GC Controller site, remove the Controller enclosure's front panel.
   (a) For the explosion-proof Controller, the front panel is secured by 16 screws. Remove those screws first.
   (b) Then carefully lower the front panel on its bottom hinges. The front panel is heavy, so make sure it does not drop and cause damage.
   (c) For the rack mount Controller, the rear of the enclosure is open; it allows access for most field wiring procedures without removing the enclosure.
   (d) Locate the GC Controller's Terminal Board for Field Wiring (TB). The TB is attached to the GC Controller's Card Cage Assembly, facing the enclosure's front panel. (In the rack mount Controller, the TB faces outward toward the rear of the enclosure.)
2. Loosen the six screws that secure the TB. Then unplug the TB from its connections at the back, top of the board.
3. Lower the TB down and out of the way, held in place by its ground straps at the bottom of the board. This exposes the Card Cage Assembly.
4. Loosen the four screws that secure the Card Cage Assembly to the chassis. Then remove the Card Cage Assembly away from its chassis mount so that it is easy to work on.

5. Locate the System Interface and Driver board. It is mounted to the top of the Card Cage Assembly.

   (a) Disconnect the Analog cable from J6 on the System Interface Board, then disconnect all CPU cables from the System Interface Board.

   (b) Remove the CPU assembly and install the COM4A Board, with associated mounting hardware to J19 and J20 PC/104 Bus connector on the CPU assembly.

**NOTICE**

**If an option board is already plugged into the PC/104 bus on the CPU, the modem and mounting hardware will be installed into the PC/104 connector on the option board.**

   (c) Plug one end of the Ethernet extension cable (P/N 3-2350-088) into J5 of the Ethernet assembly.

6. The in-line jack on the remaining end of the Ethernet extension cable attaches to the lower left inside wall of the card cage shield, after the CPU assembly is reinstalled and all cables reconnected to the System Interface board (see Table 2-7 and Table 2-8 below).

No software setup is required for this board.

*Table 2-7 System Interface Board Cable Connections*

| Connection | Ribbon Cable |
|---|---|
| J5 and J6 | Analog I/O |
| J8 | Com3 |
| J10 | Com4 |
| J4 | Printer |
| J11 | Com2 |
| J2 and J3 | Digital I/O |
| J12 | Front Panel and Keyboard (if installed) |

*Table 2-8 CPU Board Cable Connections*

| Connection | Ribbon Cable |
|---|---|
| J1 | Com1, Com2, and Printer |
| J4 and J7 | Digital I/O |
| J6 | Com3 and Com4 |

(a) If the 2350A BOS version is v1.84 or later, ensure that J6 Jumper on pins 13-14 of J1 has been removed. (see Figure 2-9 and Figure 2-10).

**NOTICE**

**If you are using the CSA approved Radicom modem; ensure that it is the top card in the card cage assembly. The connection configuration of the Radicom modem requires installation at the top of the assembly.**

7. If a modem is installed, remove the phone cord.

8. Install the Ethernet card and set the jumpers as shown below.

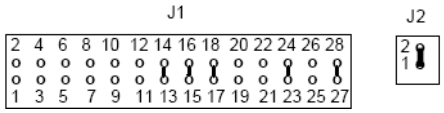



*Figure 2-9 Ethernet Jumper Configuration BOS v1.82 and Earlier*

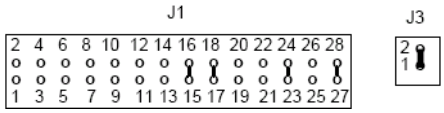



*Figure 2-10 Ethernet Jumper Configuration BOS v1.84 and Later*

## 2.13.4 Ethernet TCP/IP Settings

If you plan to connect via an Ethernet connection, use the following instructions.

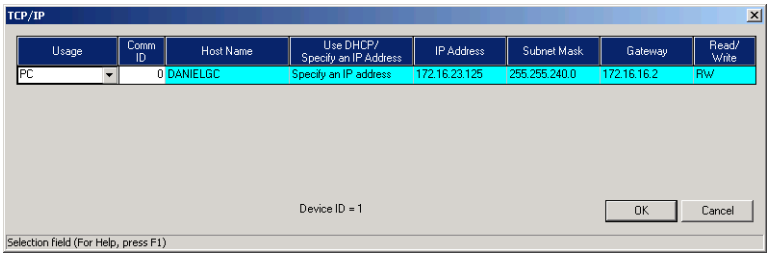
To configure the Ethernet TCP/IP settings for the 2350A GC Controller:

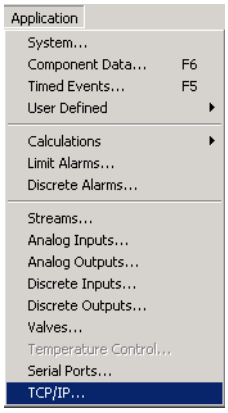
1. Obtain the IP Address, Subnet Mask, and Gateway addresses (numbers) for the Target 2350A GC Controller from your supervisor or Information Technology Department.

**NOTICE**

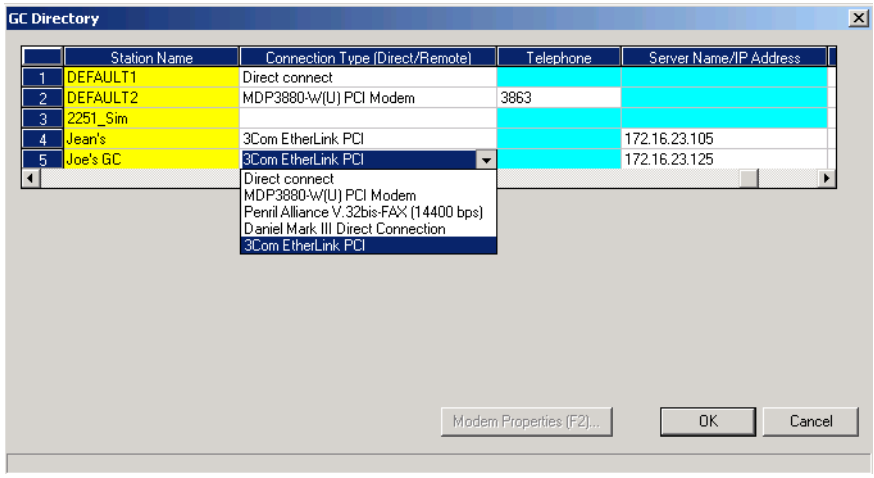
**If the controller has never been configured for Ethernet communications, logon to the Model 500 GC using either the Direct Connect option, or connect remotely via a Modem.**

2. Use the *Application* > *TCP/IP* menu to access this function.
3. The TCP/IP dialog appears.

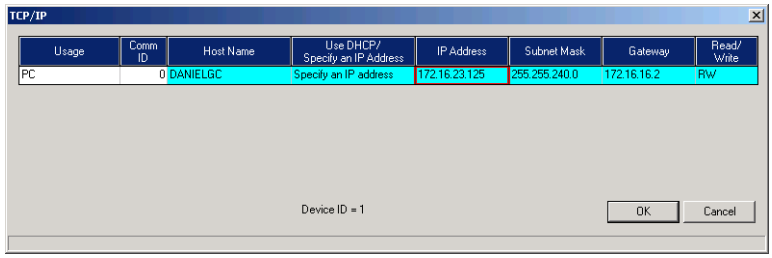


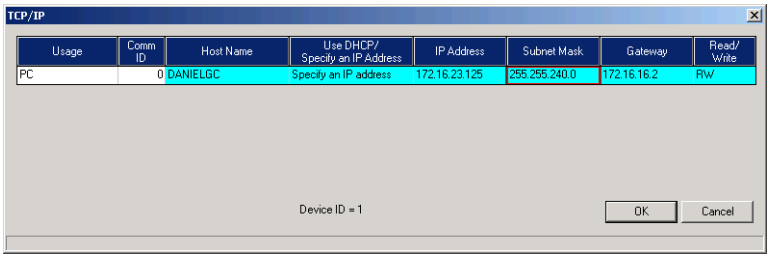
4. Go to the *Use DHCP/Specify an IP Address* field and select **`Specify an IP Address`**.



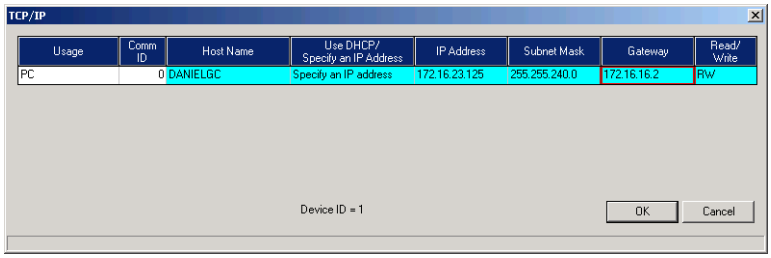

5. In the IP Address field, enter the IP Address (number) obtained from your Supervisor or the Information Technology Department.



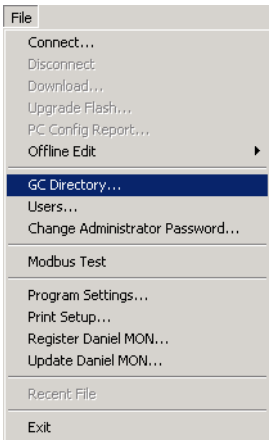
6. In the Subnet Mask field, enter the subnet mask address (number) obtained from your Supervisor or the Information Technology Department.




7. In the Gateway Address field, enter the Gateway Address (number) obtained from your Supervisor or the Information Technology Department.



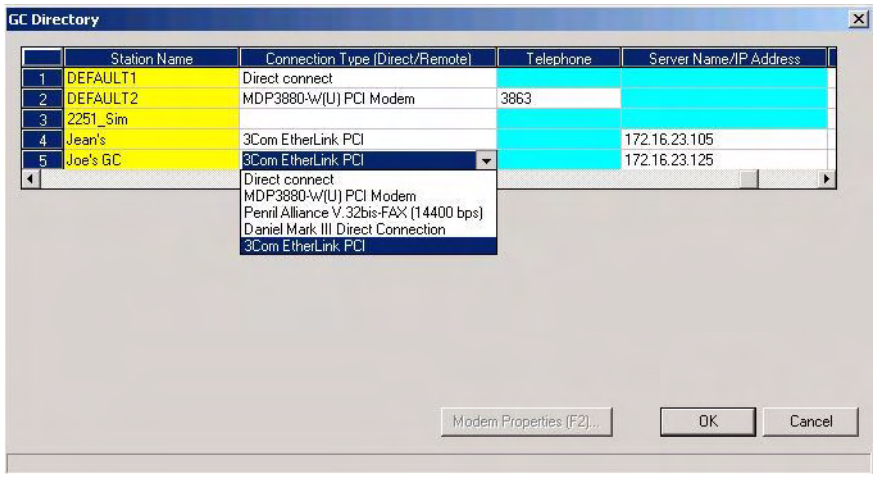

8. Click the OK button to apply all changes.
9. Disconnect from the controller, using the toolbar icon or by using the *File>Disconnect* menu.



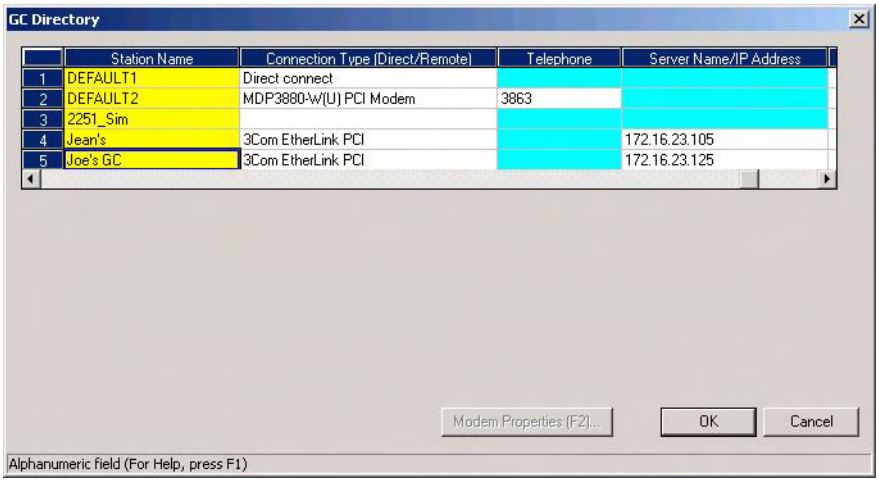

## 2.13.5 MON2000 TCP/IP Settings

To configure the Ethernet TCP/IP settings for the MON2000,

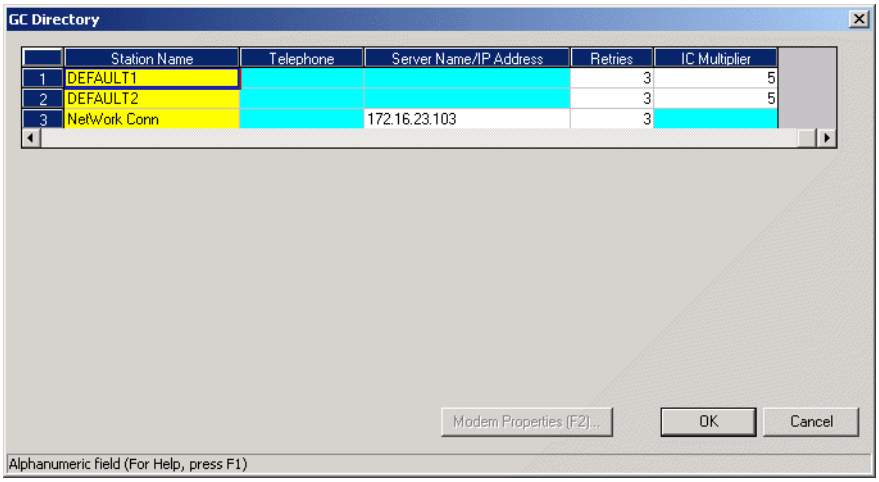
1. From the *File* menu, select GC Directory.
2. Ensure that an Ethernet location has been created or an existing location modified and that an Ethernet card installed in the PC has been selected in the field labeled Connection Type (Direct/Remote).



3. Enter the same 'IP Address' into the Server Name/IP Address field of the GC Directory that was previously entered in the GC Controller (see Section 2.9.2).




4. Set the number of retries to three.




Click the OK button to apply your changes.

## 2.14 CONNECT VIA GC EXTERNAL MODEM

**NOTICE**

**Ensure you have a pre-existing PC connection to the GC unit before installing the external modem. If the GC unit is already on location, do this via another remote operator connection, or, onsite, via use of a portable PC and serial cable. Ideally, configure the GC unit and install the external modem prior to placement at the remote location.**

**Note: You cannot set the Serial Ports parameters from the GC unit front panel.)**

### 2.14.1 HARDWARE SETUP

1. Halt any ongoing analysis runs.

   Use the *Control* > *Halt* menu to access this function.

2. Disconnect AC power from the GC Controller.

**WARNING**

**SERIOUS PERSONAL INJURY OR DEATH POSSIBLE**

**Before removing the unit cover from the GC Controller, make certain the power supply switch is OFF and the AC power cord is disconnected. Observe all safety precautions when you are working in a hazardous environment.**

Failure to observe all safety precautions could result in serious injury or death.

3. For the explosion-proof Controller, remove the cover from the GC Controller housing to expose the GC Controller Terminal Board for field wiring.

   For the rack mount Controller, the rear of the enclosure is open; it allows access for most field wiring procedures without removing the enclosure.

4. Connect a custom-made serial line cable (for RS-232 serial transmission) from the serial port of the external modem to an available serial port on the GC Controller Terminal Board for field wiring.

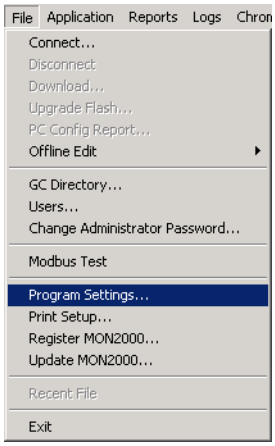
**NOTICE**

**Special hardware modifications may be needed when operating an external GC modem from the GC serial ports 3 or 4 (COM3 or COM4), as follows:**

- **DE-20782 (see drawing addendum of *Model 500 Gas Chromatograph System Hardware Reference Manual*, P/N 3-9000-537).**
- **Transient protection modules M7 and/or M4, located on the back side of the GC Controller Terminal Board for field wiring, may need replacement with the transient protection modules for RS-232 signals (P/N 3-2350-027). Note that M4 serves COM3 and M7 serves COM4.**

   - Make note of the serial port number you choose for connection. You will need this information later to make appropriate software settings.
   - Use an RS-232 serial cable no longer than 50 feet. Longer distances may result in spurious loss or corruption of transmitted data.
   - See Section 5.15, for details of GC Controller serial port connectivity (i.e., port locations, pinouts, connector types, gender, cabling, etc.).

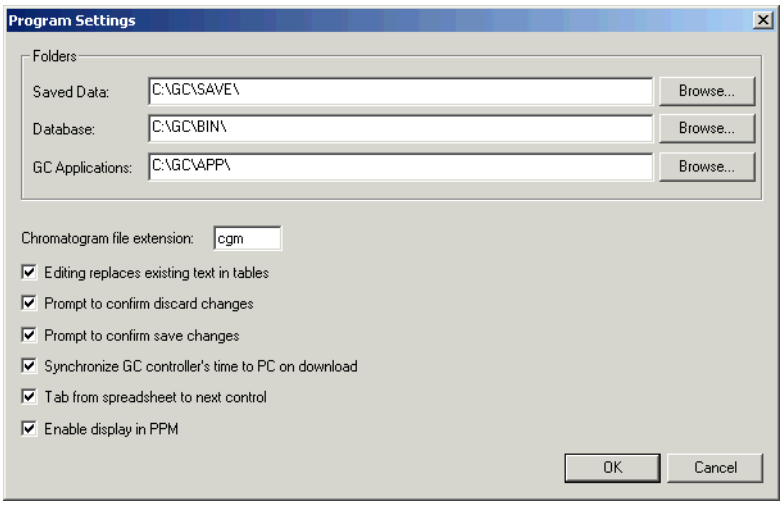
5. Connect a telephone line (from wall phone jack, if available) to the phone jack for the external modem.
6. Set external modem for Auto Answer (see external modem user manual).




## 2.14.2 Select Program Settings

This function allows you to configure where database, GC applications, and Modbus Test program files are stored.

1. Use the *File* > *Program Settings* menu to access this function.
2. The Program Settings dialog appears.




3. To use a Chromatogram file extension other than the default (e.g. **.CGM**) or to select the location of saved data, GC database, and GC application files,
   - click in the Chromatogram file extension data field and type the desired file extension
   - click in the appropriate data field and type the desired directory,

   Or

   - click the Browse... button and use the directory tree to select the desired location

4. Use the provided check boxes to turn the following settings on/off. Note that the default settings are ON.

*Table 2-9 Optional Program Settings*

| Setting | Function |
|---|---|
| Editing replaces existing text in tables | If enabled, replaces selected table cell entry with user input.<br>If disabled, appends user input to end of the selected table cell entry. |
| Prompt to confirm discard changes | Display confirmation dialog before exiting a dialog that contains changed data. |
| Prompt to confirm save changes | Display confirmation dialog before saving changed data. |
| Synchronize GC Controller's time to PC on download, etc. | Program the GC Controller clock to match the PC clock upon download. |
| Tab from spreadsheet to next control | Move from field to field and button to button (rather than from cell to cell within a spreadsheet or tabular display). |
| Enable display in PPM | If enabled, percentages less than 0.99% are displayed in PPM (parts per million) rather than as a percentage. |

5. Click the

button to apply your changes and return to the main screen.

   Click the

button to exit and return to the main screen without applying your changes.

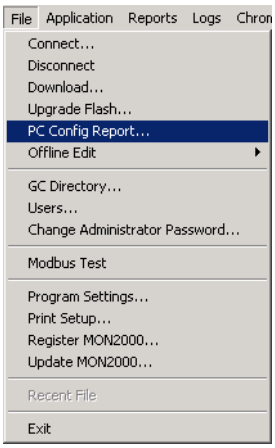
**NOTICE**

**Output data for the PC Config Report depends on the GC Controller and its application.**

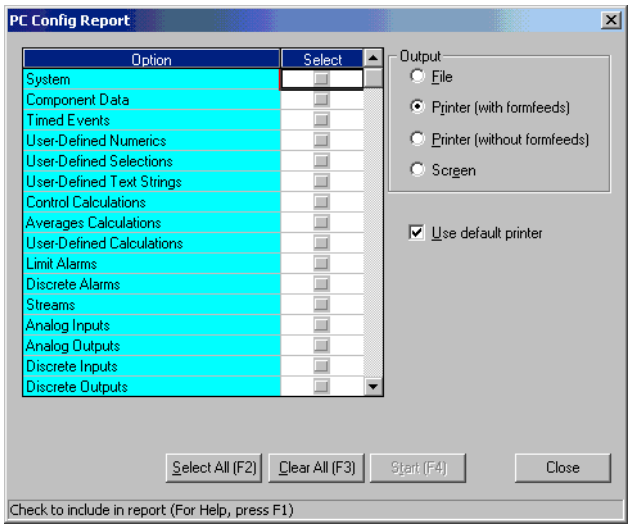
### 2.14.3 Generate PC Config Report

This function allows you to generate or print out a report of the currently active GC application control settings. See Appendix A for a sample print-out of a PC Config Report.

To view a PC Config Report already saved to disk, see Section 7.1.2.




1. Use the *File* > *PC Config Report* menu to access this function. The PC Config Report dialog appears.
2. Click the check boxes (see *Select* column) to choose the data you want included in the configuration report.




Click the Select All (F2) button or press the F2 key to select all options.

Click the Clear All (F3) button or press F3 to deselect (i.e., clear) all checked options.

3. Use the *Output* radio buttons to either save the report to disk, print the report with or without form feeds, or display the report via the report viewer (see Section 7.1).

   The *File* option will open the Save As dialog, with CONFIG.TXT as the default file name.

   The *Printer (with form feeds)* option will print the report, with form feeds, to your configured printer (see Section 3.7).

   The *Printer (without form feeds)* option will print the report, without form feeds, to your configured printer (see Section 3.7).

   The *Screen* option will launch the report viewer (see Section 7.1).

4. Click

the button or press the F4 key to generate your customized PC Config Report.

**NOTICE**

**If you are online with the GC Controller, a PC Config Report that includes all options can require up to 20 minutes to generate and save. Printing a full report can take longer.**

**If you press the ESC key, MON2000 will stop after the current option is completed.**

A progress bar appears, indicating the completion status.

**NOTICE**

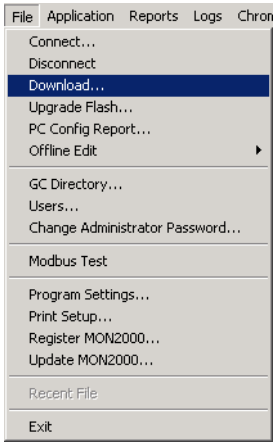
**If you want to use the standard Windows® Print dialog to select a printer, deselect the *Use default printer* option.**

## 2.15 DOWNLOADING AN APPLICATION

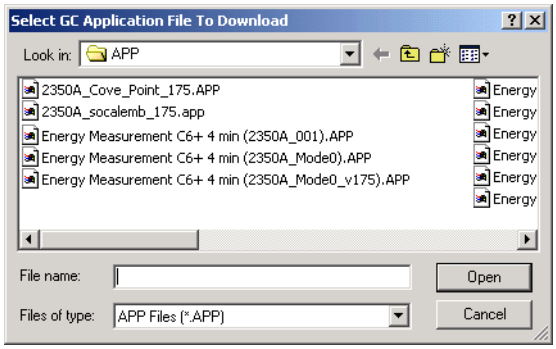
This function allows the MON2000 operator to download applications to GC Controllers. GC applications with the .APP extension can only be down loaded to 2350A GC Controllers and Model 700 units. The Download feature is NOT available if the keylock switch is closed.

At the end of the download process, MON2000 displays the Set GC Time dialog, which allows you to accept or change the GC Controller's date and time.

Only download an application when performing an initial startup, downloading a new GC application, or after the GC unit has been out of service. You must first connect to the GC to use the Download function.




1. Use the *File* > *Download* menu to access the Select GC Application File To Download dialog.



2. Click the desired .app file. The file name appears in the *File name* data field.

**NOTICE**

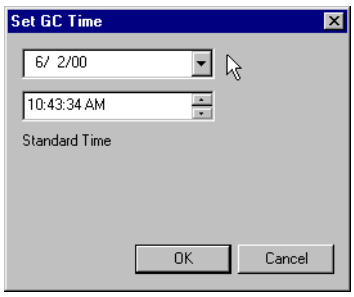
**GC application files contain all control settings and application program functions (see Section 5) specific to a particular GC Controller.**

**For 2350A GC Controllers and the Model 700 controller, application files (.app files) are normally stored in the \GC\APP directory.**

3. Click the Open button to download the selected application file to the connected GC unit.

   Click the Cancel button to exit and return to the main window.

4. MON2000 reads the time at the GC Controller and the Set Time dialog appears appears for you to edit or accept (see Section 4.7.2 for more information).




5. A progress bar appears, indicating the completion status. See Table 2-10 for a listing of the automatically enabled function keys.

*Table 2-10 Main Menu Function Keys Enabled by Download*

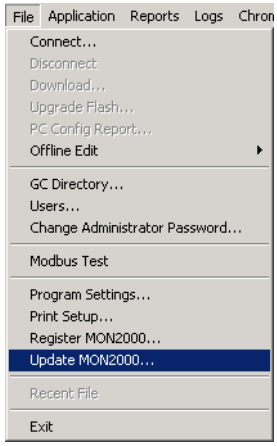
| Key | Function | Description |
|---|---|---|
| F1 | Help | Access context-sensitive online help. |
| F2 | Start Auto Sequence | Initialize the Auto-Sequencing function. This function is also available via the *Control* > *Auto Sequence* menu. |
| F3 | Halt | Stop a function at the end of the current cycle. This function is also available via the *Control* > *Halt* menu. |
| F5 | Edit TEVs | Display the Timed Event Tables. This function is also available via the *Application* > *Timed Events* menu. |
| F6 | Edit CDTs | Display the Component Data Tables. This function is also available via the *Application* > *Component Data* menu. |
| F7 | View Current CGM | Display chromatogram of the stream currently being analyzed. This function is also available via the *Chromatogram* menu. |
| F8 | View Last CGM | Display chromatogram stored in the GC unit. This function is also available via the *Chromatogram* menu. |

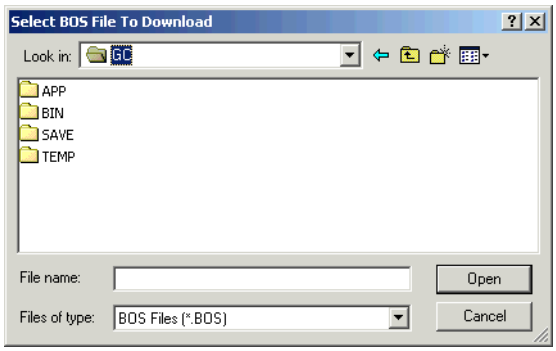
## 2.16 UPGRADING FLASH

Use this function to download a BOS file to a connected GC Controller.

Only download a BOS file when upgrading the GC firmware or after the GC unit has been out of service. You must first connect to the GC to use the Upgrade Flash function.

1. Use the *File* > *Upgrade Flash* menu to access the Select BOS File To Download dialog.




2. Click the desired BOS file. The file name appears in the *File name* data field.

3. Click the Open button to download the selected BOS file to the connected GC unit.

   Click the Cancel button to exit and return to the main window.

## 2.17 OFFLINE EDIT OF GC APPLICATION

Use this function to edit a GC application file that is saved on disk or has been downloaded (and is currently on, or being used by, the GC unit).

When selecting Offline Edit, you can choose either:

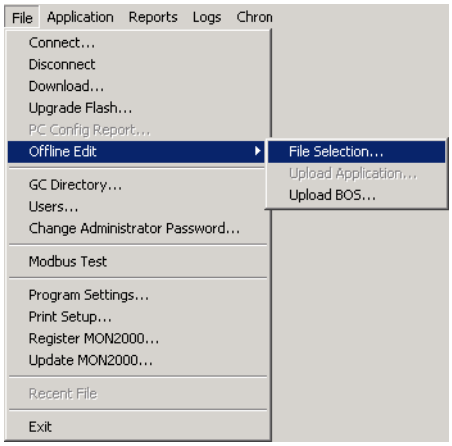
- File Selection – Allows you to edit a GC application file stored on disk.
- Upload Application – Allows you to upload the current GC application data from the GC Controller and save to file for future editing.
- Upload BOS - Allows you to upload the current BOS (i.e., firmware) file from the GC Controller to save for future download.

See the following sections for detailed instructions.

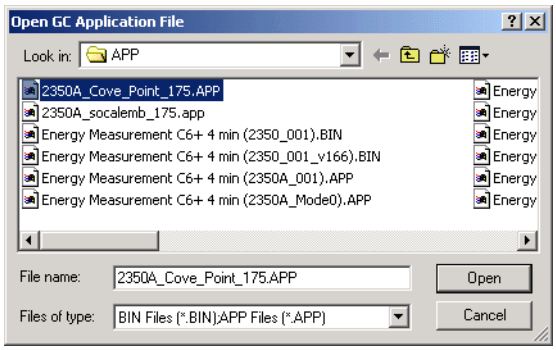
### 2.17.1 File Selection

This function allows you to edit a GC application file stored on disk.

1. Use the *File* > *Offline Edit* > *File Selection* menu to access this function.




The Open GC Application File dialog appears.



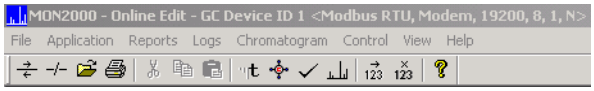

Using the directory tree, select the desired application file.

2. Click the Open button.
3. Edit this file by using the MON2000 Application functions (see Section 5 for more information).

**NOTICE**

**The GC application files (.APP) are normally stored in the \GC\App directory.**

Note that the application file name is displayed in the GC status dialog and the File Edit mode (i.e., Offline Edit) is displayed in main screen titlebar.



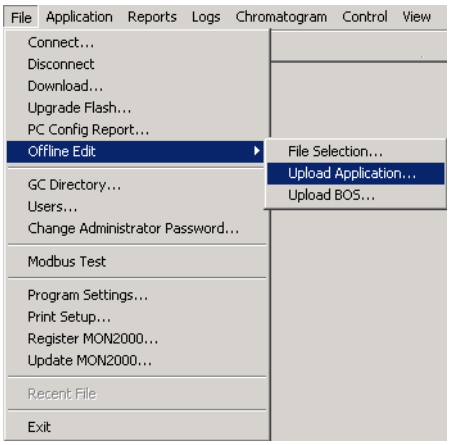

When you have finished editing this file, you can download it to the GC Controller (see Section 2.15) or save for future use.

### 2.17.2 Upload Application

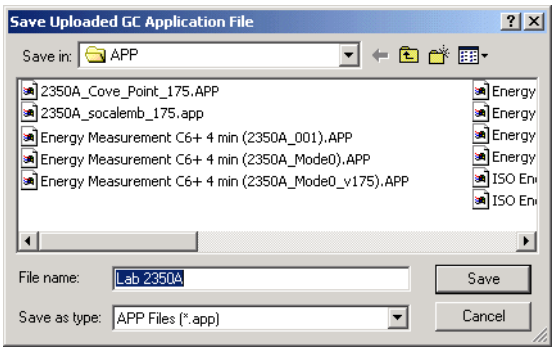
This function allows you to upload the application from an online GC Controller to a disk file and edit that file.

When connected to the GC, this function allows you to upload the current GC application data from the GC Controller and save to file for future editing. When the application upload is complete the connection will be terminated (i.e., disconnected).

1. Establish a connection to the GC.
2. Use the *File* > *Offline Edit* > *Upload Application* menu to access this function.

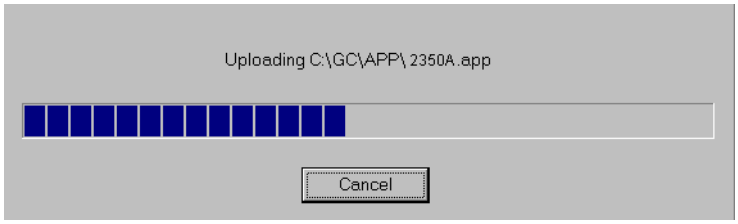


3. The Save Uploaded GC Application File menu appears.

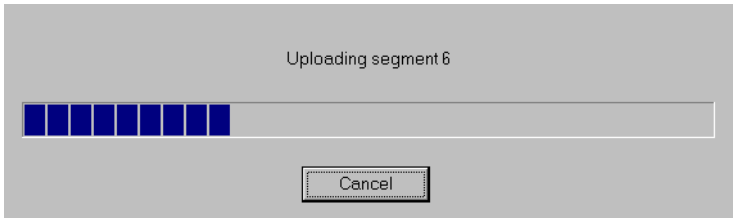



Use this dialog to choose the directory and file name or create a special file name for this particular application upload. Click the Save button.

4. MON2000 displays the message "Uploading C:\GC\APP\2350A.app" in the progress status bar.



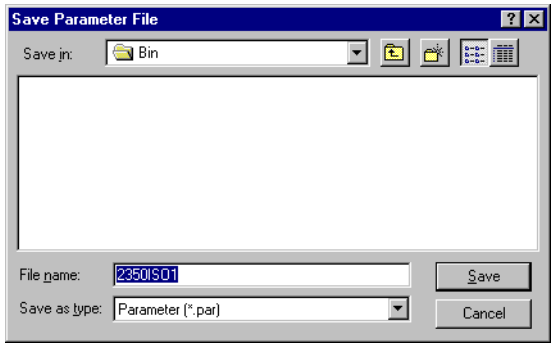

MON2000 continues with the upload process and displays the message, "Uploading Segment 1 (through segment 15)" in the status bar and a progress bar appears.




Once all of the segments are uploaded and the application file (.app) has been saved,

MON2000 prompts you to save the parameters file.

5. The Save Parameter File dialog appears.

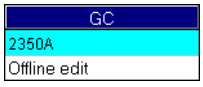



Use this dialog to choose the directory location and file name or create your own parameter file name. Click the Save button to continue.

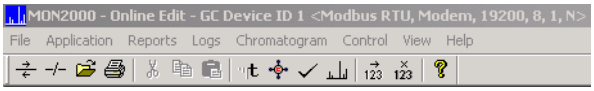
6. MON2000 saves the parameter data to the selected directory. When the upload is complete, your connection to the GC unit is automatically terminated.

7. You are now viewing the uploaded application file off-line.

   You can edit this application by using the MON2000 Application functions (see Section 5 for more information).




Note that the application file name is displayed in the GC status dialog and the File Edit mode is displayed in the main screen titlebar.

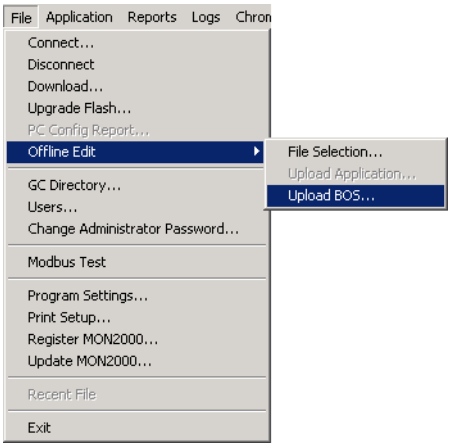



When you have finished editing this file, you can download it to the GC Controller (see Section 2.15) or save for future use.

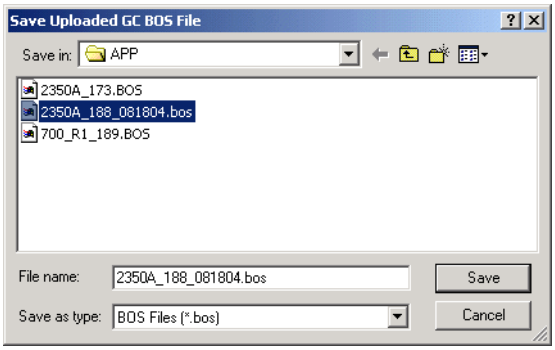
### 2.17.3 Upload BOS

When connected to the GC, this function allows you to upload the current BOS (i.e., firmware) file from the GC Controller to save for future download (see Section 2.16).

1. Use the *File* > *Offline Edit* > *Upload BOS* menu to access this function.




2. The Save Uploaded GC BOS File dialog appears.




**NOTICE**

**By default, GC BOS files are stored in C:\GC\APP folder.**

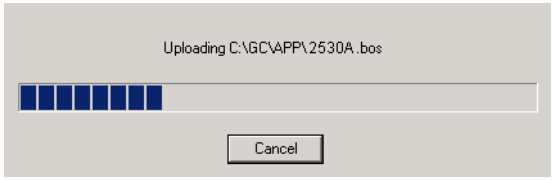
**NOTICE**

**MON2000 will not perform a BOS upload during an analysis run. You must halt the analysis first (see Section 4.3) or wait until the GC is idle.**

3. Use this dialog to choose the directory location and file name or create a file name for this particular upload. Click the Save button to continue.

   The message:

   "Uploading C:\GC\APP\2350A.bos" appears in the status bar and a progress bar appears.




**NOTICE**

**A BOS upload usually takes 10 minutes to complete.**

4. MON2000 begins to upload the BOS to the selected file. When the upload is complete, normal MON2000 operations resume.

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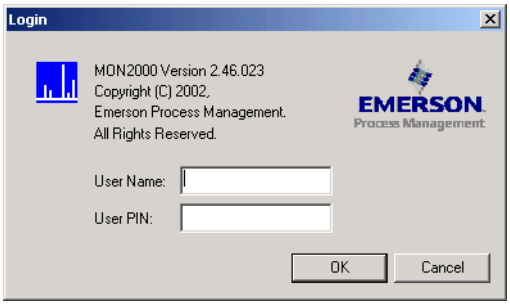
# GETTING STARTED

This section shows you how to get started with the MON2000 software, covering such functions as logging on, navigation, and configuring your PC printer for MON2000.

## 3.1 LOGGING ON

To log on,

1. Start the MON2000 software program by clicking the desktop icon or using the Windows® Start menu (see Section 2.5).




2. Click the *User Name* data field and type your assigned user name (up to 12 characters). Note that the user name is not case-sensitive and can include characters such as "*", "-", ".", etc.

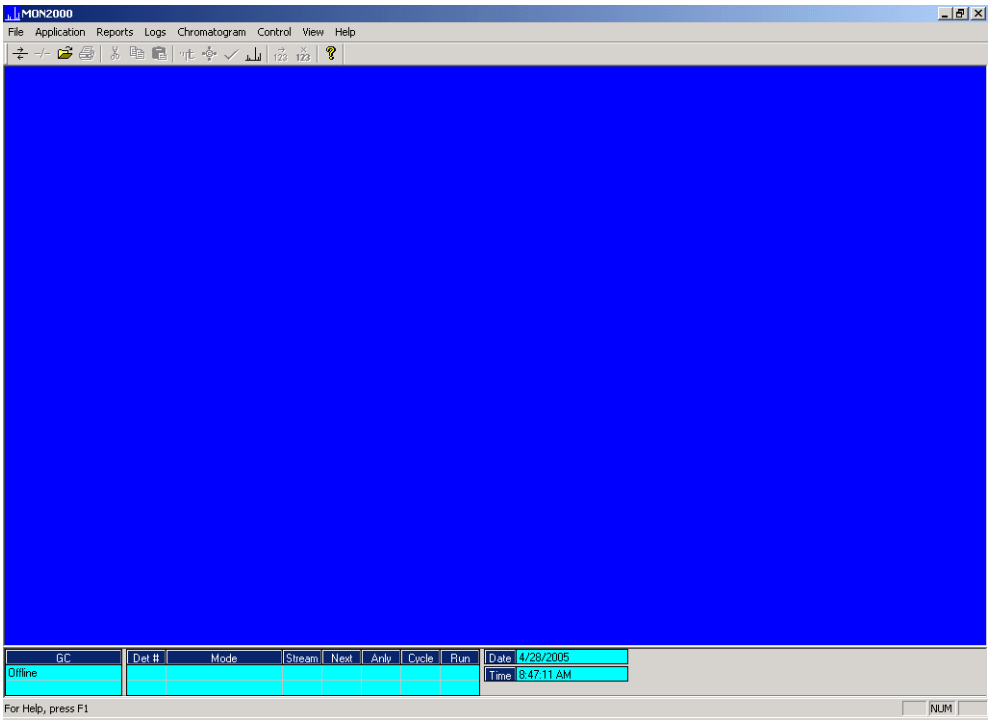
3. If required, click the *User PIN* data field and type your assigned PIN.

**NOTICE**

**If you enter an incorrect user name or user PIN, a error message appears:**

**Click the OK button to exit and return to the Logon dialog.**

4. When you have successfully logged on, the MON2000 main window appears.



## 3.2 LOGGING OFF

**NOTICE**

**Ensure that you exit the MON2000 program and shut down Windows before powering off the PC.**

To log off,

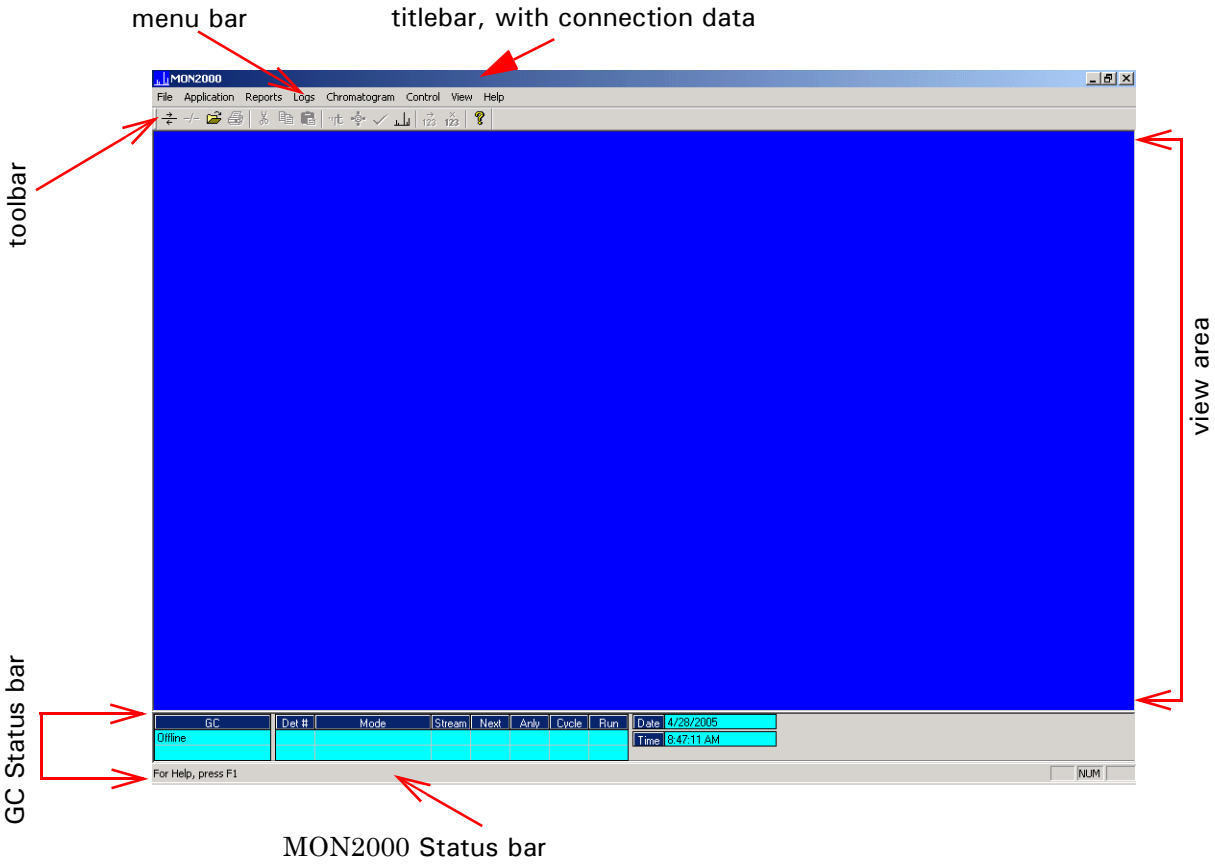
1. Disconnect from the GC unit (see Section 2.8.2).
2. Exit the MON2000 program by
   - using the *File* > *Exit* menu
   - pressing the ESC key
   - clicking the ✕ button

## 3.3 MON2000 USER INTERFACE

Use the following sections to familiarize yourself with the MON2000 user interface.

### 3.3.1 Main Window

The MON2000 main window typically looks like this:

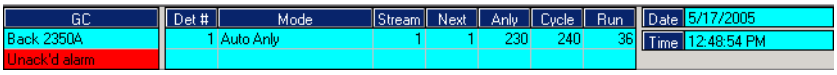



Use the available menus, icons (see toolbar area and Section 3.3.4), and function keys (see Section 3.4) to access the desired functions.

### 3.3.2 GC Status Bar

The status bar appears across the bottom of the application window. To display or hide the status bar, click the Status Bar command using the *View* menu (ALT + V, G).

Access this menu command from the *View* menu (ALT+ V, S) to display and hide the GC Status Bar, which displays the following:




- GC - name of the GC currently online
- Alarm status (Unacknowledged)
- Detector number
- Mode (e.g., analysis; Calibration mode or Analysis mode)
- Streams - number current streams
- Next - next stream number to run)
- Anly - analysis cycle
- Run - run time
- Date - current date is displayed
- Time - current time is displayed

The left area of the status bar describes actions of menu items as you use the mouse pointer over the menu selection. This area similarly shows messages that describe the actions of toolbar buttons as you press and hold them. After viewing the description of the toolbar button command and you do not wish execute the command, move the mouse pointer away from the toolbar command, then release the mouse button.

The right areas of the status bar indicate which of the following keys are activated:

| Indicator | Description |
|---|---|
| CAP | the Caps Lock key is ON. |
| NUM | the Num Lock key is ON |
| SCRL | the Scroll Lock key is ON |

**NOTICE**

**Your connection status is also displayed in the titlebar.**

**If "Online Edit" appears, then MON2000 is connected to the GC and is recognizing the existing application.**

**If "Connected" appears, then MON2000 is connected to the GC but does not recognize the existing application.**

**If no connection data is displayed, there is no connection.**

The GC Status bar consists of:

| Item | Description |
|---|---|
| GC | GC unit to which MON2000 is currently connected<br><br>A status flag indicates an active alarm, an unacknowledged alarm, or the File Edit mode (offline editing). |
| Det # | detector monitoring the alarm status of the currently connected GC<br><br>A GC unit can have up to 2 detectors. |
| Mode | mode of the Detector<br><br>Typical modes are:<br>• Idle<br>• Auto Cal<br>• Auto Base<br>• Auto Anly<br>• FCal |
| Stream | current stream being analyzed |
| Next | next sample stream to be analyzed |
| Anly | analysis time |
| Cycle | total cycle time (seconds), selected before starting another analysis |
| Run | time (seconds) elapsed since current cycle began |
| Date/Time | date and time, per PC clock |

### 3.3.3 View Menu

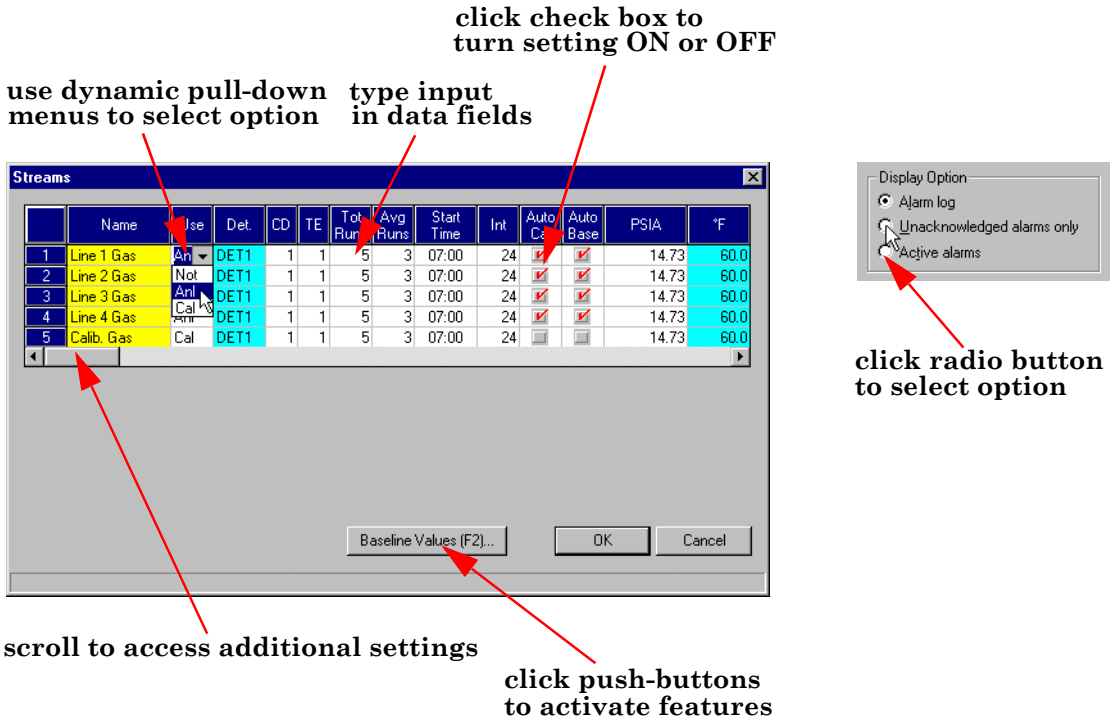
Use the *View* menu to toggle (i.e., switch ON or OFF) which main window component you wish to view. See Section 3.3.1 for an identification and definition of each component.

### 3.3.4 ToolTips

To view a ToolTip, move the mouse cursor to the Toolbar icon you want identified. MON2000 displays the ToolTip for five seconds.

### 3.3.5 Data Entry and Function Features

Use the data boxes, buttons, check boxes, and toggles to input data or to choose options and activate features.



### 3.3.6 Shortcut to Save or Print Data

From any active dialog, right-click the displayed data to access this menu.

Choose the *Save Sheet* option to save data to disk or the *Print Sheet* option to queue data to your PC printer. MON2000 prints the report to your configured printer (see Section 3.7).

**NOTICE**

**Microsoft Internet Explorer 5.0 (or later) is required to view a spreadsheet file saved in HTML format.**

## 3.4 KEYBOARD SHORTCUTS

MON2000 supports keystrokes as well as a standard PC mouse interface. Use a mouse to perform point-and-click operations.

Refer to the following table for common keyboard shortcuts. See Table 3-2 for function keys that can be used after an application has been downloaded to the GC Controller.

*Table 3-1 Frequently Used Keystrokes*

| Keystroke | Action |
|---|---|
| ARROW keys | Move cursor:<br>• left or right in a data field<br>• up or down in a menu or combo box<br>• up or down (column), left or right (row) through displayed data entries |
| DELETE | • Delete the character after cursor.<br>• Delete selected rows from a table or return row values to the default settings. |
| ENTER | • Add a blank item or row to selected table.<br>• Activate the default control element (e.g., the OK button) in current window. |
| ESC | Exit application or active window without saving data. |
| F1 | Access context-sensitive help topic. |
| INSERT | • Toggle between insert and type-over mode in selected cell.<br>• Insert a new row above the highlighted row. |
| SHIFT+TAB | Move to previous control element (e.g., button) or data field in window; see TAB description. |

*Table 3-1 Frequently Used Keystrokes (Continued)*

| Keystroke | Action |
|---|---|
| SPACE | Toggle settings (via radio buttons or check boxes). |
| TAB | Move to next control element (e.g., button) in window; use File > Program Settings (see Section 2.14.2) to use TAB key to move to next data field. |

*Table 3-2 Application-Specific Function Keys*

| Function Key | Action |
|---|---|
| F2 | Start Auto Sequence<br><br>**NOTICE**<br><br>**These keystrokes are available from the main menu only. Function key definitions will change per the active dialog/function.**<br><br>Starts the Auto-Sequencing function (see Section 4.1). |
| F3 | Halt<br><br>Halts the GC program (e.g., an analysis run) at the end of the current cycle (see Section 4.3). |
| F5 | Edit TEVs<br><br>Displays the Timed Event Table (TEV) per specified stream (see Section 5.3). |
| F6 | Edit CDTs<br><br>Displays the Component Data Table (CDT) per specified stream (see Section 5.2). |
| F7 | View Current CGM<br><br>Displays the chromatogram for the sample stream being analyzed (see Section 6.1). |
| F8 | View Last GC CGM<br><br>Displays any chromatogram stored in the GC Controller (see Section 6.1). |

## 3.5 PROCEDURES GUIDE

Use the following table to look up the related manual section and menu (and keystroke) for a given procedure.

*Table 3-3 Menu and Manual Section per MON2000 Procedure*

| Task or Data Item | Section(s) | Menu [Keystroke] |
|---|---|---|
| 24-Hour Average, component(s) measured | 5.5.2 | Application > Calculations > Averages |
| alarms, related components | 5.2 | Application > Component Data [F6] |
| | 5.6 | Application > Limit Alarms |
| | 5.7 | Application > Discrete Alarms |
| | 5.12 | Application > Discrete Outputs |
| alarms, stream number(s) programmed | 5.6 | Application > Limit Alarms |
| Analysis Report (on/off) | 7.3 | Reports > GC Printer Control |
| | 7.4 | Reports > MON2000 Printer Control |
| analysis time | 5.3 | Application > Timed Events [F5] |
| auto-calibration (on/off) | 5.8 | Application > Streams |
| Auto-Calibration Interval | 5.8 | Application > Streams |
| Auto-Calibration Start Time | 5.8 | Application > Streams |
| autocal time | 5.8 | Application > Streams |
| Baseline | 5.8 | Application > Streams, Baseline Values [F2] |
| base pressure used for calculations | 5.8 | Application > Streams |
| BTU-dry (on/off) | 5.5.1 | Application > Calculations > Control |
| calibration concentration | 5.2 | Application > Component Data [F6] |
| calibration cycle time | 5.3 | Application > Timed Events [F5] |
| calibration runs, number averaged | 5.8 | Application > Streams |
| calibration runs, number of | 5.8 | Application > Streams |
| calibration stream number | 5.8 | Application > Streams |
| communications baud rate, at GC | 5.15 | Application > Serial Ports |

*Table 3-3 Menu and Manual Section per MON2000 Procedure (Continued)*

| Task or Data Item | Section(s) | Menu [Keystroke] |
|---|---|---|
| communications baud rate, at PC | 2.9.3 | File > (COM ID) |
| component code and name | 5.2 | Application > Component Data [F6] |
| component full scale (for output) | 5.1<br><br><br>5.10 | Application > System<br>(CGM Analog Output Config and Baseline Offset)<br>Application > Analog Outputs |
| component(s) programmed for input | 5.9<br>5.11 | Application > Analog Inputs<br>Application > Discrete Inputs |
| component(s) programmed for output | 5.6<br>5.7<br>5.10<br>5.12 | Application > Limit Alarms<br>Application > Discrete Alarms<br>Application > Analog Outputs<br>Application > Discrete Outputs |
| component, retention time | 5.2 | Application > Component Data [F6] |
| component zero (for output) | 5.10 | Application > Analog Outputs |
| Compressibility (on/off) | 5.5.1 | Application > Calculations > Control |
| current date | 4.7 | Control > GC Time |
| current time | 4.7 | Control > GC Time |
| cycle time | 5.3 | Application > Timed Events [F5] |
| delete alarms | 5.6<br>8.3 | Application > Limit Alarms<br>Log > Alarm Log |
| delete component from component list | 5.2 | Application > Component Data<br>[F6], [DELETE] |
| delete inhibit, integration, peak width | 5.3 | Application > Timed Events [F5] |
| delete output(s) | 5.6<br>5.7<br>5.10<br>5.12 | Application > Limit Alarms<br>Application > Discrete Alarms<br>Application > Analog Outputs<br>Application > Discrete Outputs |
| edit numeric value | 5.4.1 | Application > User Defined > Numeric |
| edit select values | 5.4.2 | Application > User Defined > Selection |
| edit text strings | 5.4.3 | Application > User Defined > Text Strings |

*Table 3-3 Menu and Manual Section per MON2000 Procedure (Continued)*

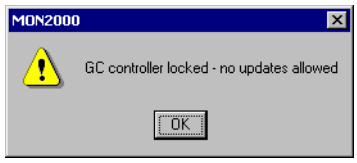
| Task or Data Item | Section(s) | Menu [Keystroke] |
|---|---|---|
| existing alarm(s) | 8.3 | Log > Alarm Log |
| full-scale value (for input) | 5.9 | Application > Analog Inputs |
| GPM liquid equivalent (on/off) | 5.5.1 | Application > Calculations > Control |
| height or area measurement method | 5.2 | Application > Component Data [F6] |
| High Alarm | 5.6 | Application > Limit Alarms |
| (Analyzer) I.D. | 2.9.2<br>5.1 | File > GC Directory<br>Application > System |
| inhibit on-off times | 5.3 | Application > Timed Events [F5] |
| input(s) being used | 5.9<br>5.11 | Application > Analog Inputs<br>Application > Discrete Inputs |
| integration on-off times | 5.3 | Application > Timed Events [F5] |
| Low Alarm | 5.6 | Application > Limit Alarms |
| Mole percent (on/off) | 5.5.1 | Application > Calculations > Control |
| Normalization (on/off) | 5.5.1 | Application > Calculations > Control |
| outputs being used | 5.6<br>5.7<br>5.10<br>5.12 | Application > Limit Alarms<br>Application > Discrete Alarms<br>Application > Analog Outputs<br>Application > Discrete Outputs |
| Peak Width, on time | 5.3 | Application > Timed Events [F5] |
| Ratio (on/off) | 5.5.3 | Application > Calculations > User Defined |
| Ratio Denominator | 5.5.3 | Application > Calculations > User Defined |
| Ratio, stream number(s) | 5.5.3 | Application > Calculations > User Defined |
| Relative Density (on/off) | 5.5.1 | Application > Calculations > Control |
| Response Factor | 5.2 | Application > Component Data [F6] |
| Response Factor, percent deviation | 5.2 | Application > Component Data [F6] |
| Retention Time, percent deviation | 5.2 | Application > Component Data [F6] |
| Rolling Average (on/off) | 5.5.2 | Application > Calculations > Averages |

*Table 3-3 Menu and Manual Section per MON2000 Procedure (Continued)*

| Task or Data Item | Section(s) | Menu [Keystroke] |
|---|---|---|
| Rolling Average, component for | 5.5.2 | Application > Calculations > Averages |
| Rolling Average, number of analyses | 5.5.2 | Application > Calculations > Averages |
| Rolling Average, stream number(s) | 5.5.2 | Application > Calculations > Averages |
| Spectrum Gain | 5.3 | Application > Timed Events [F5] |
| stream number(s) (for output) | 5.6<br>5.7<br>5.10<br>5.12 | Application > Limit Alarms<br>Application > Discrete Alarms<br>Application > Analog Outputs<br>Application > Discrete Outputs |
| stream sequences skipped, number | 5.1<br>5.8 | Application > System<br>Application > Streams |
| streams analyzed, number | 5.1<br>5.8 | Application > System<br>Application > Streams |
| streams analyzed, sequence | 5.1<br>5.8 | Application > System<br>Application > Streams |
| Valve on/off times | 5.3 | Application > Timed Events<br>[F5] |
| Weight Percent (on/off) | 5.5.1 | Application > Calculations > Control |
| Wobbe value (on/off) | 5.5.1 | Application > Calculations > Control |
| Zero value (for input) | 5.9 | Application > Analog Inputs |

## 3.6 KEYLOCK SWITCH CONTROL

If your GC unit has the keylock control enabled, you will not be able to write changes or new data to the GC Controller. The following error dialog will display.




To see which Modbus registers are affected by the keylock control, view the Communications section of the PC Config Report via the Report Viewer (see Appendix A for instructions and an example).

When closed ('on'), the GC keylock switch protects many of the GC Controller's parameters from being changed using MON2000.

Most of the dialog boxes in the Application's menu allows you to view data but does not allow you to save changes when the keylock switch is closed. Several items in the Reports and Control menus are unavailable when the keylock switch is closed. The Users dialog cannot be downloaded to the GC Controller when the keylock switch is closed. A GC application cannot be downloaded to the GC Controller when the keylock switch is closed.

Since most of the GC Controller's parameters are protected by the keylock switch, it is easiest to list the operations that are available when the keylock switch is closed. The following operations are available when the keylock switch is closed:

**NOTICE**

**The keylock switch affects only online operations, i.e. those that are performed while connected to a GC Controller.**

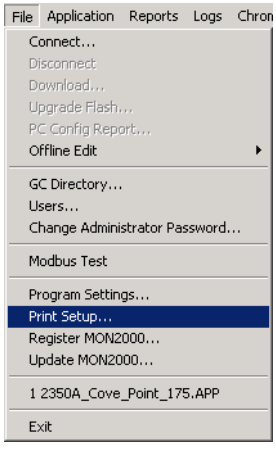
**The keylock switch feature is only available on controllers with BOS version 1.6 and later. The GC Controller parameters protected by the keylock switch may vary slightly from version to version.**

The stream sequences can be changed in the System dialog box. (GC applications version 1.7 and above.)

- Automatic calibration in the Analog Outputs dialog box
- Report display
- GC report request (GC applications version 1.7 and above)
- MON2000 printer control (GC applications version 1.7 and above)
- View archive data
- Trend data
- Maintenance Log editing (GC applications version 1.7 and above)
- Alarms (except clear/ack all active alarms)
- Event log
- Chromatogram viewer (including forced calibration using archived chromatograms)
- Start Auto-Sequencing
- Start single stream
- Halt analysis
- Start calibration
- View and set GC time (GC applications version 1.7 and above)

## 3.7 CONFIGURING YOUR PRINTER

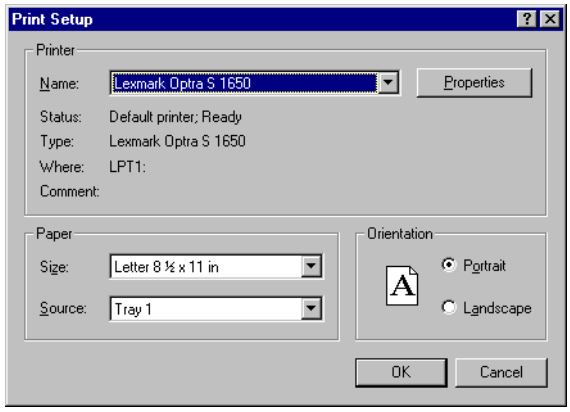
Use this function to configure the settings for the printer connected to your PC. This configuration will apply to any print job queued from MON2000.




The settings available depend on the printer type. Refer to the manufacture's user manual for more information.

1. Use the *File* > *Print Setup* menu to access this function.

2. The Printer Setup dialog appears.




3. Use the provided data fields, radio buttons, check and combo boxes to select the desired settings.

   Click the Properties button to configure more advanced settings.

   Refer to the printer operator manual for more information.

4. Click the OK button to queue the printer.

   Click the Cancel button to abort and return to the main window.

**NOTICE**

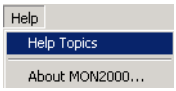
**Your configuration will be cleared (i.e., the settings will return to the default values) when you exit MON2000.**

## 3.8 USING ONLINE HELP

Currently, the online help feature contains all user information and instructions for each MON2000 function as well as the MON2000 system.

To access the MON2000 Application Help file,

- Press the F1 key at any time to view help topics that discuss the currently active dialog or function.
- Use the *Help* > *Help Topics* menu to view the help contents dialog.




Use the scroll bars and arrows to display more of a topic. You can also resize and/or move the topic dialog for better viewing convenience.

When applicable, a topic will contain links to other related topics, notes, and helpful popups. Use these links as you need.

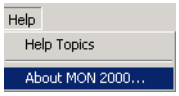
## 3.9 OPERATING MODES FOR MODEL 700

The Model 700 GC supports four different operating modes. Each mode allows the GC to analyze data from a given number of detectors, streams, and methods. See Table 3-4 for more information.

*Table 3-4 Operating Modes for Model 700*

| Mode ID Number | Detectors Supported | Streams Supported | Methods Supported |
|---|---|---|---|
| 0 | 1 | 1 | 1 |
| 1 | 2 | 1 | 1 |
| 2 | 2 | 2 | 2 |
| 3 | 2 | 1 | 2 |

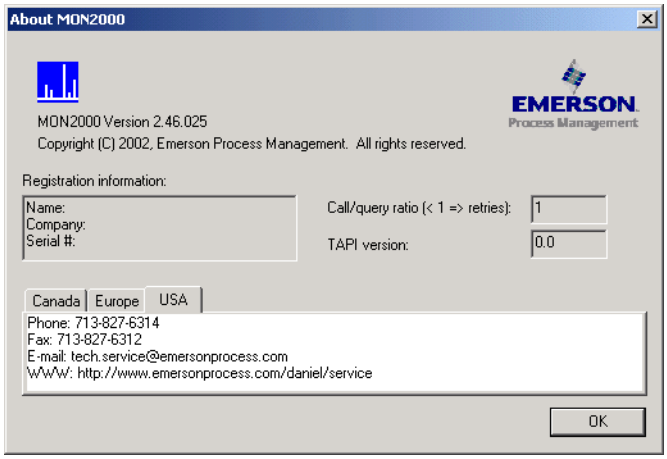
## 3.10 ABOUT MON2000




To verify information such as the software version number, copyright date, and the call/query ratio.

1. Use the *Help* > *About* MON2000 menu to access this dialog.

2. MON2000 appears the About MON2000 dialog.




The *Call/Query Ratio* estimates the quality of your serial communications. If this ratio is less than or equal to 0.5, then the connection is problematic. The maximum value of 1 indicates a good connection.

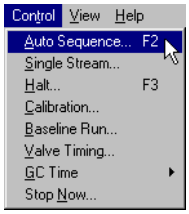
The *TAPI version* represents the Telephony API software MON2000 accesses for dial-up (i.e., remote) communications.

3. Click the OK button to exit and return to the main window.

# CONTROL FUNCTIONS

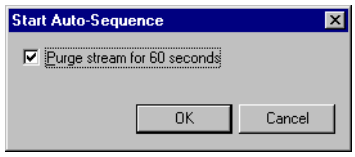
The options in the Control pull-down menu allow you to initiate various operating modes of the gas chromatograph (GC) unit.

## 4.1 AUTO SEQUENCE




Use this function to start continuous GC analysis runs that follow a predefined stream sequence. At the initial startup, the current stream (in the stream sequence) is the first stream analyzed. See Section 5.8 for detailed instructions on configuring the predefined sequence.

1. Use the *Control* > *Auto Sequence* menu or press the F2 key to access this function.
2. The Start Auto Sequence dialog appears.




3. Click the *Purge* check box to set the purging option. Note that the default setting is ON.

   Purging allows sample gas to flow through the sample loop for 60 seconds prior to beginning the first analysis.

4. Click the OK button to continue.

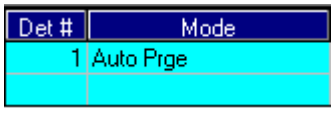
   Click the Cancel button to abort and return to the main window.

5. The Auto Sequence GC Analysis begins (if you selected the Purge Stream option, MON2000 performs this 60-second task first).

**NOTICE**

**Use the Report Display option in the Reports menu to view the results of the Auto Sequence function.**

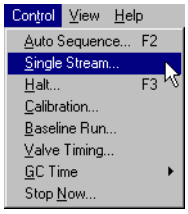
Use the status bar to monitor the progress of this function.



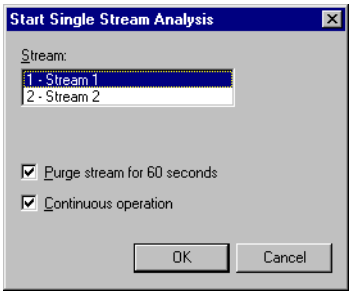

To change the operating parameters, such as the Timed Event Tables (TEVs) and Component Data Tables (CDTs), see Section 4 for information about Application functions.

## 4.2 SINGLE STREAM

Use this function to start continuous GC analysis run(s) on a single stream.




1. Use the *Control* > *Single Stream* menu to access this function.
2. The Start Single Stream Analysis dialog appears.




3. Select the desired stream from the Stream menu.
4. Click the *Purge* check box to set the purging option. Note that the default setting is ON.

   Purging allows sample gas to flow through the sample loop for 60 seconds prior to beginning the first analysis.
5. Click the *Continuous operation* check box to perform repetitive analysis runs. Note that the default setting is ON.

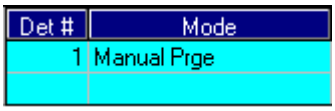
   Deselect this option if you want to perform only one analysis run.

6. Click the OK button to accept your selections and continue.

   Click the Cancel button to abort and return to the main window.

7. The Single Stream GC Analysis begins (if you selected the Purge Stream option, MON2000 performs this 60-second task first).

   Use the status bar to monitor the progress of this function.



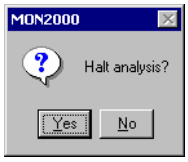

**NOTICE**

**Use the Report Display option in the Reports menu to view the results of the Single Stream function.**

## 4.3 HALT

Use this function to stop the current operation mode at the end of the run in progress.

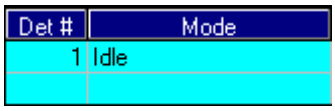
1. Use the *Control* > *Halt* menu or press the F3 key to access this function.
2. MON2000 prompts you to confirm your selection.




   Click the Yes button to proceed.

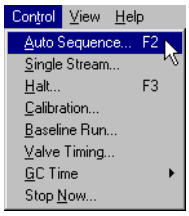
   Click the No button to abort and return to the main window.

3. After the current run finishes, the function stops and "Idle" appears in the status bar.



## 4.4 CALIBRATION

Use this function to calibrate the GC unit.



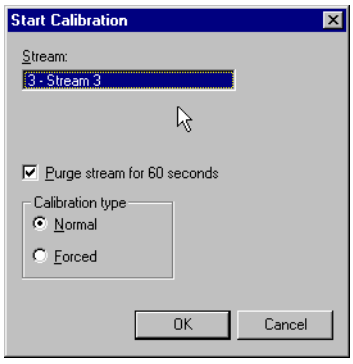

Calibration runs are determined by the CDT and Streams settings. See Section 5.2 and Section 5.8 for detailed instructions on how to edit these settings.

1. Use the *Control* > *Calibration* menu to access this function.

**NOTICE**

**If the GC unit is in Auto Sequence mode, calibration will not start until 2 or more analysis runs have been completed. This delay is required to complete the current analysis and the analysis of the stream currently purging through the valve.**

2. The Start Calibration dialog appears.




MON2000 displays the stream to be used for the calibration.

To select which stream is used for calibration, see Section 5.8.

**NOTICE**

**See Section 7.1 to select report parameters.**

3. Click the *Purge* check box to set the purging option. Note that the default setting is ON.

Purging allows sample gas to flow through the sample loop for 60 seconds prior to beginning the first analysis.

4. Select the desired calibration type.

   (a) Click the *Manual* radio button to perform a manual calibration.

   The CDT for the selected stream(s) will not be updated with raw data that are outside the acceptable deviations (as listed on the CDT). For more information, see Section 5.2.

   (b) Click the *Forced* radio button to perform a manual calibration.

   The CDT for the selected stream(s) will be updated with raw data that are outside the acceptable deviations (as listed on the CDT). For more information, see Section 5.2.

**NOTICE**

**For either choice, only VAR (variable) components on the CDT are updated. See Section 5.2 for details.**

5. Click the OK button to accept your selections and continue.

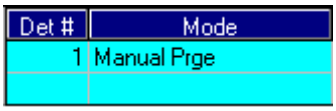
   Click the Cancel button to abort and return to the main window.

**NOTICE**

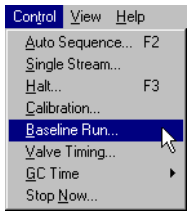
**Use the Report Display option in the Reports menu to view the results of the Calibration function.**

6. The Calibration begins.

   Use the status bar to monitor the progress of this function.




## 4.5 BASELINE RUN



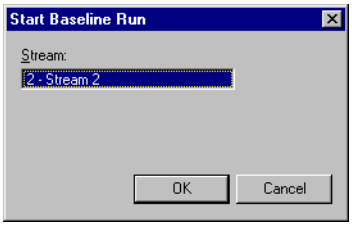

Use this function to initiate a single GC baseline run, to assess chromatogram peaks caused by the GC valve action alone. A baseline run is a calibration-like run during which no calibration or sample gas is injected (i.e., the valve is not fired).

1. Use the *Control* > *Baseline Run* menu to access this function.

**NOTICE**

**If the GC unit is in Auto Sequence mode, MON2000 prompts that the continuous analysis must be stopped. Halt the analysis (see Section 4.3) and wait for an Idle status. Then continue initiating the baseline run.**

2. The Start Baseline Run dialog appears.



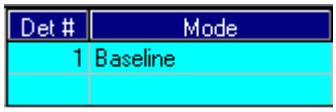

MON2000 displays the stream to be used for the baseline run.

To select which stream is used for the baseline calibration, see Section 5.8.

3. Click the OK button to continue.

Click the Cancel button to abort and return to the main window.

Use the status bar to monitor the progress of this function. Use the Report Display option in the Reports menu to view the results of the Baseline Run function?



## 4.6 VALVE TIMING

After each run is complete, the area of the selected component is compared to the area of the previous three runs. If the change is less than 1 percent, the valve OFF time and the INHIBIT ON time is updated to the current time minus one second.

Use this function to initiate a valve timing run to determine the optimal valve OFF times.

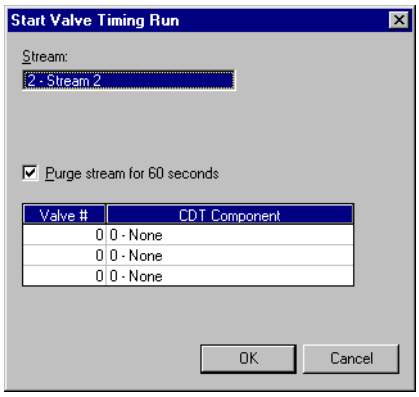
An analysis for a stream is rerun up to 10 times. During each of these runs, the OFF time for the selected valve(s) is adjusted so that the associated component "area" can be compared to the "areas" of the previous three (3) runs. If the delta is less than 1 percent, the OFF time for the valve is updated to the current time minus 1 second.

1. Use the *Control* > *Valve Timing* menu to access this function.

**NOTICE**

**If the GC unit is in Auto Sequence mode, MON2000 prompts that the continuous analysis must be stopped. Halt the analysis (see Section 4.3) and wait for an Idle status. Then continue initiating the valve timing.**

2. The Start Valve Timing Run dialog appears.




   MON2000 displays the stream to be used for the baseline run.

   To select which stream is used for calibration, see Section 5.8.

3. Click the *Purge* check box to set the purging option. Note that the default setting is ON.

   Purging allows sample gas to flow through the sample loop for 60 seconds prior to beginning the first analysis.

4. MON2000 displays the Select Valves menu.

5. Use the provided data fields and combo boxes to enter the valve number and corresponding CDT component (see Section 5.2 for more information on CDTs).

6. Click the OK button to accept your selections and continue.

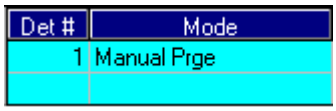
   Click the Cancel button to abort and return to the main window.

7. The Valve Timing function begins.

**NOTICE**

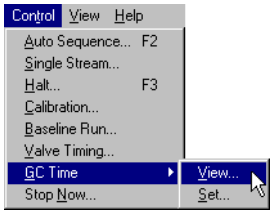
**Use the Report Display option in the Reports menu to view the results of the Valve Timing function?**

Use the status bar to monitor the progress of this function.




If no change was made to the valve timing, the following message will be posted in the Alarm Log: "valve timing failure". See Section 8.3 for detailed instructions on reading Alarm Logs. No message is recorded for a successfully optimized valve.

## 4.7 GC TIME

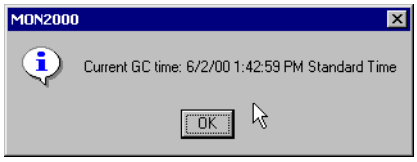



Use the GC Time function to view and, if necessary, set the system date and time used by the GC Controller.

### 4.7.1 View GC Time

To view the system date and time used by the GC,

1. Use the *Control* > *GC Time* > *View* menu to select the View option.
2. The following MON2000 dialog appears.

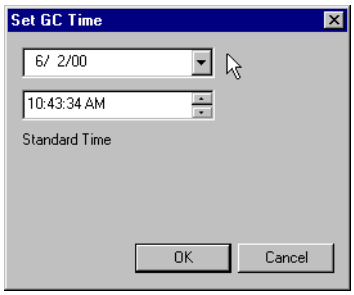



3. Click the OK button to exit this dialog and return to the main window.

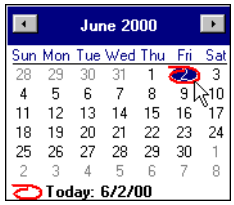
### 4.7.2 Set GC Time

To set the system date and time used by the GC,

1. Use the *Control* > *GC Time* > *Set* menu to select the Set option.
2. The Set GC Time dialog appears MON2000 indicates whether the GC Controller is on daylight saving or standard time, which depends on the configured system parameters.




3. Use the provided pull-down arrow to access an interactive calendar.

   Click the left/right arrows to view the previous or future months.

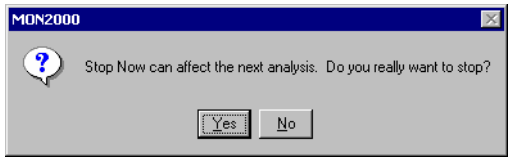
   Click the desired day for the date. Note that a blue oval appears on the selected day.
4. Select which part of the time (hour, minute, or seconds) you wish to change. Use the provided scroll arrows to increase or decrease the highlighted value.
5. Click the OK button or press the enter key to write the selected date/time to the GC Controller.

   Click the Cancel button to abort and return to the main window.

## 4.8 STOP NOW

Use this function to *immediately* stop all analysis runs.

1. Use the *Control* > *Stop Now* menu to access this function.
2. MON2000 prompts you to confirm your selection.




Click the Yes button to proceed.

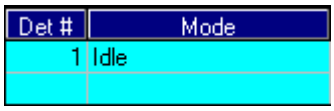
Click the No button to abort and return to the main window.

**NOTICE**

**This function forces the system to the Idle mode. If Stop Now is performed while an analysis is in progress, the components will continue to elute from the columns per the Idle mode. All resultant data will be lost.**

**Do not perform a Stop Now unless absolutely necessary. Whenever possible, use the Halt function.**

3. Any GC function in progress is stopped. The Mode field in the status bar displays 'Idle'.



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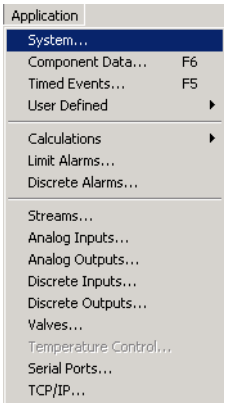
# APPLICATION FUNCTIONS

The options in the Application pull-down menu allow you to manipulate or edit the control settings that exist for particular gas chromatograph (GC) application functions. You can edit an application while online with the GC Controller or when using the Offline Edit function (see Section 2.17 for information on Offline Edit; see Section 2.15 to download an application first).

## 5.1 SYSTEM

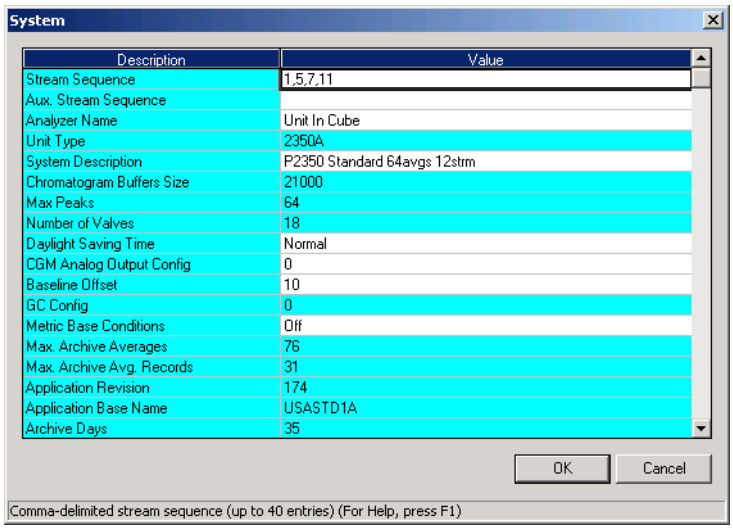



Use this function to define or edit the GC stream sequence, unit name, and system description. You can also use this function to activate Metric Base Condition for calculations based on metric units.

The System dialog also includes a series of non-editable fields for reference or trouble shooting. See Table 5-1 for a summary of the items provided by the System dialog, along with the related functions and editing status.

1. Use the *Application* > *System* menu to access this function.

2. The System dialog appears.




Click and edit any value presented in the white cells.

Note that the *Daylight Savings Time* option, when set to "Override," will make the GC Controller ignore the time change from Standard to Daylight Savings (i.e., Standard Time will remain).

3. Click the OK button to accept your changes and return to the main window.

Click the Cancel button to abort and return to the main window.

*Table 5-1 Description of Items in System Dialog*

| Item | Function | Edit |
|---|---|---|
| Stream Sequence | Defines the order of stream analysis for Detector 1. | ✓ |
| Stream Sequence 2 | Defines the order of stream analysis for Detector 2; only available with selected hardware.<br><br>Note that this item is not available in all GC applications. | ✓ |
| Aux. Stream Sequence | Defines the auxiliary order of stream analysis for Detector 1. Can be used to run an alternative stream sequence when a Discrete Input is set (see Section 5.11 for detailed instructions).<br><br>Note that this item is not available in all GC applications. | |
| Aux. Stream Sequence 2 | Additional alternative stream sequence provided for second detector in dual detector applications.<br><br>Auxiliary order of stream analysis for Detector 2. Can be used to run an alternative stream sequence when a Discrete Input is set (see Section 5.11 for detailed instructions).<br><br>Note that this item is not available in all GC applications. | ✓ |
| Analyzer Name | Defines the GC unit name that appears in the status bar of the main window when connected to the GC Controller. Can contain up to 12 characters. | ✓ |
| Unit Type | Identifies GC unit type (i.e., model number). | |
| System Description | A field to record miscellaneous reference information to further identify the system. Can contain up to 28 characters. | ✓ |
| Chromatogram Buffer Size | Provides number of bytes used to store a chromatogram. | |
| Max Peaks | Provides maximum number of peaks (application-specific). | |

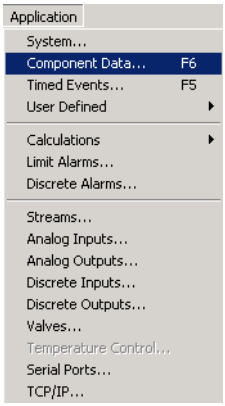
*Table 5-1 Description of Items in System Dialog (Continued)*

| Item | Function | Edit |
|---|---|---|
| Number of Valves | Identifies number of chromatographic valves (application-specific). | |
| Daylight Savings Time | Allows the GC Controller to adjust automatically for DST. "Normal" enables automatic DST adjustment (United States). "Override" disables automatic DST adjustment. | ✓ |
| CGM Analog Output | Displays chromatogram trace signals for strip chart generation from Detectors 1 and/or 2, trace 1 only. Identifies the analog output number.<br><br>If this field is set to 0, then no analog output will produce the CGM signal.<br><br>**NOTICE**<br><br>**When assigning a CGM Analog Output, also check the Analog Outputs dialog (see Section 5.10). A CGM Analog Output setting that uses a previously assigned analog output number will produce erratic CGM trace output, possibly with incorrect scaling.**<br><br>**Do not assign this item analog output number 1 if the connected GC unit supports bargraph output (see Section 5.10.3 for details).** | ✓ |
| CGM Baseline Offset | A fixed offset (percent of full scale) added to the CGM analog output to allow the user to conveniently position the chromatogram on a strip chart recorder. Displays chromatogram trace signals for strip chart generation from Detectors 1 and/or 2. Identifies the baseline offset. | ✓ |
| CFG Baseline Number | Identifies the Standard GC Application software from which this GC application or configuration was developed (i.e., the number of the standard configuration file that was used to generate the current application). | |
| Metric Base Condition | Enables (metric) or disables (off) whether MON2000 displays the GC Control Calculation in metric units. See Section 5.5.1 for details. | ✓ |

*Table 5-1 Description of Items in System Dialog (Continued)*

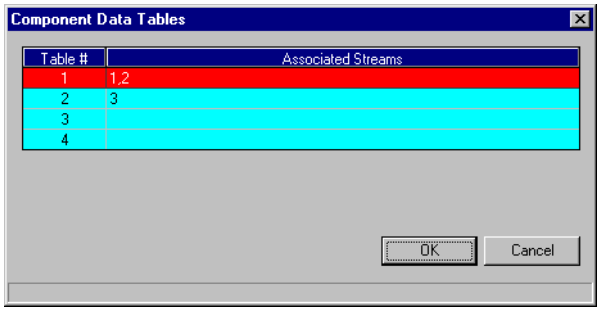
| Item | Function | Edit |
|---|---|---|
| Max Archive Averages | maximum number of averages (1-254) | ✓ |
| Max Archive Avg. Records | maximum number of archive records per average without an extended memory card (1-128) | ✓ |
| Application Revision | (non-edit) - revision level of the current application | |
| Application Base Name | (non-edit) - base name of the application | |
| Archive Days | (non-edit) – maximum number of days that archive records are kept (1-400) | ✓ |
| BOS Revision | (non-edit) – revision level of the BOS | |

## 5.2 COMPONENT DATA




Use this function to view and/or edit the Component Data Tables (CDTs) for a given GC application.

1. Use the *Application* > *Component Data* menu or press the F6 key to access this function.
2. The Component Data Tables menu appears, listing the CDTs available per associated stream(s).




Choose the desired CDT.

**NOTICE**

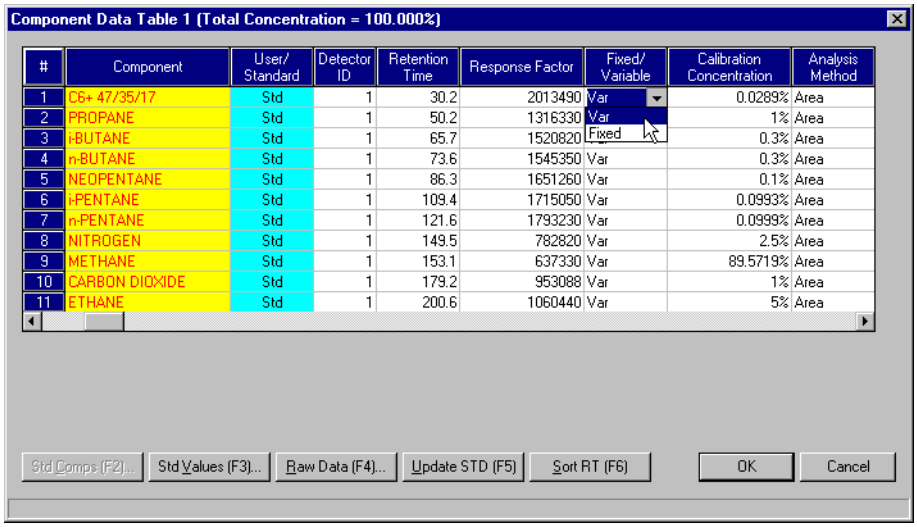
**The number of available CDTs depends on the GC unit configuration.**

**The standard GC application contains 4 CDTs. MON2000 can operate GC applications with up to 5 CDTs.**

**To assign a CDT to a stream, see Section 5.8.**

3. Click the OK button to accept your selection. The Component Data Table dialog appears.

   Click the Cancel button to abort and return to the main window.


Component Data Table 1 (Total Concentration = 100.000%)
# Component User/ Standard Detector ID Retention Time Response Factor Fixed/ Variable Calibration Concentration Analysis Method
1 C6+ 47/35/17 Std 1 30.2 2013490 Var 0.0289% Area
2 PROPANE Std 1 50.2 1316330 Var 1% Area
3 i-BUTANE Std 1 65.7 1520820 Fixed 0.3% Area
4 n-BUTANE Std 1 73.6 1545350 Var 0.3% Area
5 NEOPENTANE Std 1 86.3 1651260 Var 0.1% Area
6 i-PENTANE Std 1 109.4 1715050 Var 0.0993% Area
7 n-PENTANE Std 1 121.6 1793230 Var 0.0999% Area
8 NITROGEN Std 1 149.5 782820 Var 2.5% Area
9 METHANE Std 1 153.1 637330 Var 89.5719% Area
10 CARBON DIOXIDE Std 1 179.2 953088 Var 1% Area
11 ETHANE Std 1 200.6 1060440 Var 5% Area
Std Comps (F2)...
Std Values (F3)...
Raw Data (F4)...
Update STD (F5)
Sort RT (F6)
OK
Cancel

4. View or edit data. Double-click a given table cell or use one of the edit function buttons to make your changes.

   Some table cells will change into pull-down menus when selected. Choose your data from the pull-down menu provided.

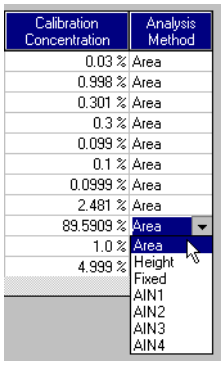
   Note that a red component name indicates a standard component. A black component name indicates that this component has been edited or defined by the user.

   For more information on the editing functions available, see Section 5.2.1 through Section 5.2.4.

   For descriptions of the standard data presented in a CDT, see Table 5-2.

**NOTICE**

**To add a new component, move the cursor to the last table cell (last row, last column) and press ENTER.**




5. Click the OK button to accept your changes and return to the main window.

   Click the Cancel button to abort and return to the main window.

*Table 5-2 Description of Standard Parameters in a CDT*

| Item | Function | Edit |
|---|---|---|
| Number (#) | component number<br><br>An index number that acts as an identification label when used in other menus/dialogs (e.g., Limit Alarms, Analog Outputs). Up to 20 components can be defined per data table. | |
| Component | names assigned to the various components displayed<br><br>Components can be selected from the standard list, by pressing the F2 key (see Section 5.2.1), or entered by the user. Up to 15 characters can be used for the component name. | ✓ |
| USR/STD | whether the component data is standard or user-defined<br><br>If the component was added by the Select Standard Component function (see Section 5.2.1) and no changes were made to the component data, STD displays. If the component was added manually by the user or modified, USR displays. | |
| Detector ID | component detector number | ✓ |
| Retention Time | time in seconds that apex of the component peak will appear<br><br>Range = 0 to 6000 seconds<br><br>**CAUTION**<br><br>**Ensure that the component retention times do not exceed the analysis time, as defined by the TEV Table (see Section 5.3). MON2000 does not automatically prevent the user from defining excessive component retention times.** | ✓ |
| Response Factor | equal to the raw data of component peak divided by component concentration<br><br>The maximum value is 1.0E+38. | ✓ |

*Table 5-2 Description of Standard Parameters in a CDT (Continued)*

| Item | Function | Edit |
|---|---|---|
| Fixed/Variable | whether a component response factor is fixed or variable<br><br>A fixed response factor will not be updated during calibration. | ✓ |
| Calibration Concentration | component concentration in calibration gas<br><br>To enter a PPM, type "Xp"; e.g., "4.0p" will appear as "4.0 ppm". Values above 90 PPM are converted to percentages. | ✓ |
| Analysis Method | used to determine component raw data value<br><br>Use the pull-down menu to select either area, height, fixed, or the appropriate analog input (used with auxiliary analyzer). | ✓ |
| RT Percent Dev. | maximum acceptable percentage of deviation of the new retention time from the current retention time | ✓ |
| RT Secs. Dev. | maximum acceptable deviation time, in seconds, of the new retention time from the current retention time | ✓ |
| RT Update Method | determines when component retention time will be updated<br><br>Select Analysis to update after each run.<br><br>Select Calib to update only during final calibration run. | ✓ |
| Resp. Factor % Dev. | maximum acceptable percent deviation between the new response factor and the current response factor | ✓ |
| Total Concentration | total concentration of all components | |

**CAUTION**

**See Table 5-2 an asterisk (*) in the column heading indicates a column that contains standard component values. If any of these values is modified, the corresponding component becomes non-standard (i.e., user-defined). It is not recommended that you edit a standard component value.**

### 5.2.1 Select Standard Component(s)

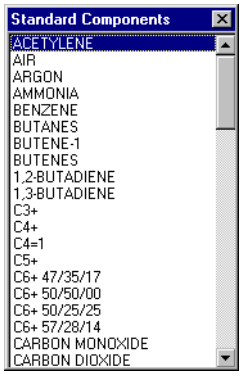
To select standard component(s) to be used by the displayed CDT,

1. Select the *Component* cell where you want the new component.
2. Click the STD Comps (F2)... button or press the F2 key to access the Standard Components menu.
3. The Standard Components menu appears.
4. Double-click the selected component to add it to the CDT. The component is automatically inserted into the selected table cell.

   Click the ✕ button or press the ESC key to abort and return to the Component Data Table dialog.

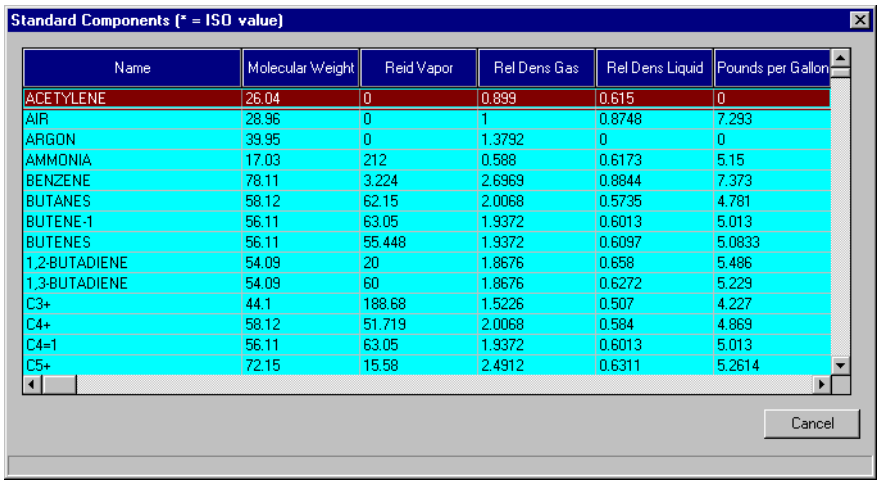
**NOTICE**

**To add a new row to the CDT, click the last cell in the last row and press the ENTER key.**



### 5.2.2 Select Standard Values

To read the values for the standard components, click the Std Values (F3)... button or press the F3 key to access the Standard Components dialog.




Click the Cancel button to return to the CDT.

### 5.2.3 Update Standard Component(s)

**NOTICE**

**Typically, this function should only be performed when the MON2000 software is upgraded.**

**User-defined components are not affected by this update.**

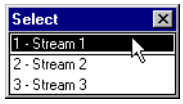
Click the Update STD (F5) or press the F5 key to upgrade the Standard Components list of this CDT to match the MON2000 Standard Component menu.

Note that this function updates the standard component list for the current CDT. MON2000 displays a confirmation dialog when a standard component is changed.

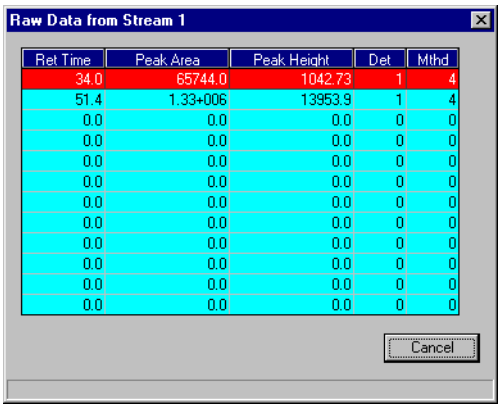
### 5.2.4 View Raw Data

To view the raw data for the displayed CDT,

1. Select the desired row from the currently displayed CDT.
2. Click the Raw Data (F4)... button or press the F4 key to access the Raw Data dialog.
3. The Stream Selection dialog appears. Double-click the desired stream or click the ✕ button to exit. Only the streams associated with this CDT will display in the list menu.




4. The Raw Data dialog appears, listing the peak raw data from the last run of the stream represented by the CDT.




5. The MON2000 operator can now copy the Retention Time from the Raw Data screen to the CDT as follows:
   (a) Before pulling up the Raw Data screen, click Component #1 of the CDT.
   (b) Click the Raw Data button or press the (F4) key to access the Raw Data screen.
   (c) Press the **ENTER** key to copy the Retention Time (the next component's

**NOTICE**

**When first displayed during a session, the Select Stream dialog highlights the stream that has the most recent raw data. Thereafter, the previously selected stream is highlighted.**

RT is automatically targeted by MON2000). Then, press the **DOWN ARROW** key to advance to the next 'Raw Data' value.

(d) Repeat Step (c) until all Retention Times have been copied to the CDT.

6. Click the Close button to clear the Raw Data screen.

Following is an example of a Raw Data Table.

*Table 5-3 Raw Data Table*

| Description | Method |
|---|---|
| Baseline Resolved | 1 |
| Fused | 2 |
| Last of Fused Group | 3 |
| Tangent Skimmed | 4 |
| Resolved Rider Peak | 5 |
| Fused Rider | 6 |
| Last of Fused Rider | 7 |
| Tailing Peak | 8 |
| Forward Horizontal | 20 |
| Backward Horizontal | 40 |
| Baseline Forced at Valley | 60 |
| Inhibit On | 100 |
| Forced Integrate On | 200 |
| Forced Integrate End | 300 |
| Plateau Detect | 400 |
| Summation | 500 |

**NOTICE**

**Some methods are a combination of the above types, e.g. 103 is LAST OF FUSED GROUP (3) and INHIBIT ON (100).**

### 5.2.5 Sort Retention Time

To sort the components listed in the displayed CDT by their retention times,

1. Click the Sort RT (F6) button or press the F6 key to access this function.
2. MON2000 automatically sorts the components.

**NOTICE**

**MON2000 sorts components by the corresponding detector number first, then by the Retention Time.**

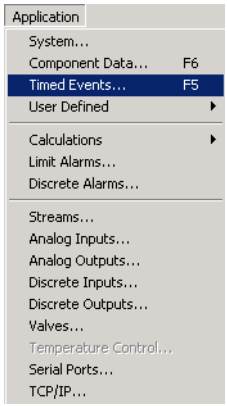
**NOTICE**

**Sorting the CDT components by retention time may affect one or more of the following:**

- **Analog Outputs**
- **Averages**
- **Bargraphs**
- **Limit Alarms**
- **User Defined Calculations**

## 5.3 TIMED EVENTS

Use this function to view and/or edit the GC Timed Events Tables (TEVs) assigned to and used by particular gas streams.




**Timed Events Description**

**NOTICE**

**See Section 6.6.2 for details about editing from the *Chromatogram* > *Chromatogram Viewer* menu.**

- Analysis Time - Input total analysis time. LIMITS: 0.0 to 6000.0 seconds
- Cycle Time - Input total cycle time. LIMITS: 0.0 to 6000.0 seconds
- Off During Baseline (per sample valve) - toggle check boxes to select which valve(s) remain off during a baseline run

**NOTICE**

**The Cycle Time must be at least 10 seconds greater than the Analysis Time.**

### Valve Events

- Type - use the pull-down menu to select between valve number (Valve #), discrete output channel number (DO #), and stream switch (Strm Sw); additional selections SSO1, SSO2, Bleed1, Bleed2, Block1 and Block2 are available for the Model 700 GC applications
- Valve/DO # (for valves and discrete outputs only) - input the valve number or discrete output channel number. Use the provided combo box to select valve number by name
- State (for all types except for stream switch) - use the pull-down menu to toggle ON\OFF
- Time - input the time that the event is to occur. LIMITS: 0.0 to 6000.0 seconds

### Integration Events

- Type - use the pull-down menu to select between Inhibit, Integrate, Auto Zero, Slope Sensitivity, Peak Width, Single Baseline, FID Gain, Summation, or Fused Override
- Value - For peak width or slope sensitivity, input the number of points to be used. LIMITS: Peak Width and Slope Sensitivity, 1 to 99
- For FID gain, use the pull-down menu to toggle Low\High.
- For Single Baseline, use the pull-down menu to toggle OFF\BGN (Beginning)\END.
- Except for AutoZero, for all others use the pull-down menu to toggle ON\OFF. Auto Zero does not have 'Value' field.
- Det - enter the appropriate detector number that the event will effect. Valid range is '1' or '2'
- Time - input the time that the event is to occur. LIMITS: 0.0 to 6000.0 seconds

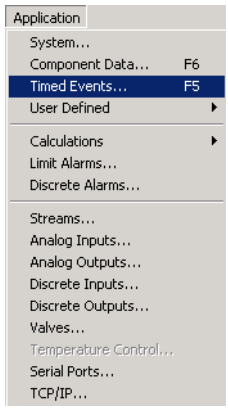
### Spectrum Gain Events

- Detector # - use the pull-down menu to select between detectors #1 and #2
- Gain - input the gain value for that detector. LIMITS: 0 to 24
- Time - input the time that the event is to occur. LIMITS: 0.0 to 6000.0 seconds

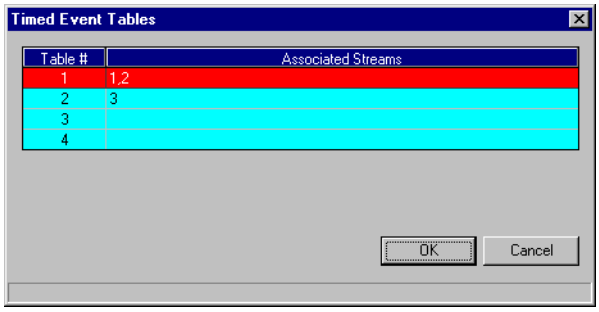
**NOTICE**

**See Section 6.6 for editing TEVs from CGM Viewer.**

To access the Timed events feature,




1. Use the *Application* > *Timed Events* menu or press the F5 key to access this function.
2. The Timed Event Tables menu displays, listing the TEVs available per associated stream(s).




Choose the desired TEV.

**NOTICE**

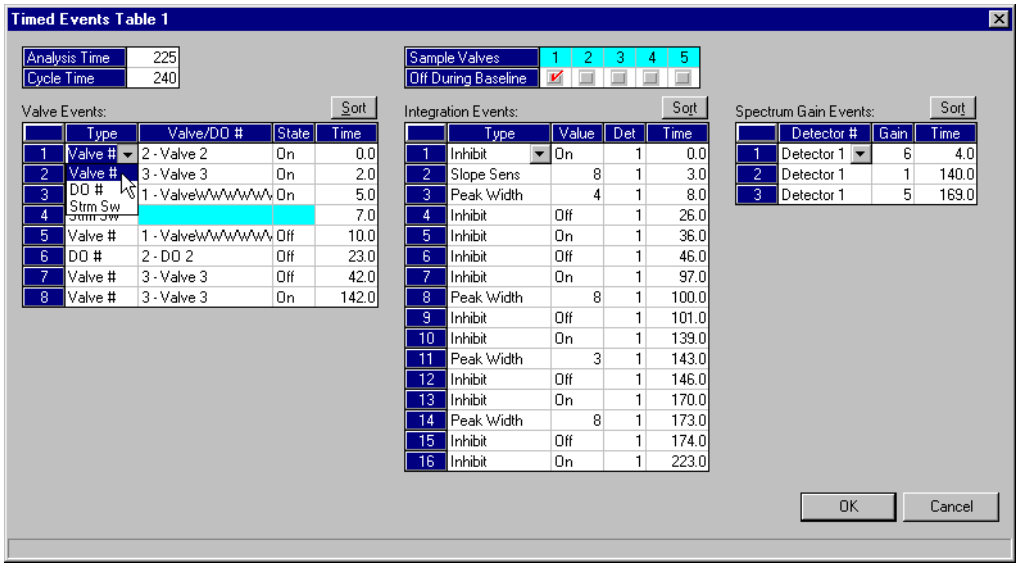
**The number of available TEVs depends on the GC unit configuration.**

**The standard GC application contains four TEVs. MON2000 can operate GC Applications with up to five TEVs.**

**To assign a TEV to a stream, use the Streams function (see Section 5.8).**

3. Click the OK button to accept your selection. The Timed Events Table dialog appears.

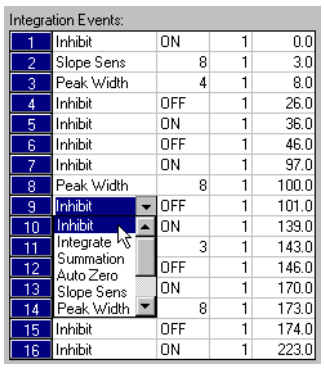
   Click the Cancel button to abort and MON2000 returns you to the main window.


Timed Events Table 1
Analysis Time 225
Cycle Time 240
Sample Valves 1 2 3 4 5
Off During Baseline
Valve Events:
Sort
Type Valve/DO # State Time
1 Valve # 2 - Valve 2 On 0.0
2 Valve # 3 - Valve 3 On 2.0
3 DO # 1 - ValveWWWWW On 5.0
4 Strm Sw 7.0
5 Valve # 1 - ValveWWWWW Off 10.0
6 DO # 2 - DO 2 Off 23.0
7 Valve # 3 - Valve 3 Off 42.0
8 Valve # 3 - Valve 3 On 142.0
Integration Events:
Sort
Type Value Det Time
1 Inhibit On 1 0.0
2 Slope Sens 8 1 3.0
3 Peak Width 4 1 8.0
4 Inhibit Off 1 26.0
5 Inhibit On 1 36.0
6 Inhibit Off 1 46.0
7 Inhibit On 1 97.0
8 Peak Width 8 1 100.0
9 Inhibit Off 1 101.0
10 Inhibit On 1 139.0
11 Peak Width 3 1 143.0
12 Inhibit Off 1 146.0
13 Inhibit On 1 170.0
14 Peak Width 8 1 173.0
15 Inhibit Off 1 174.0
16 Inhibit On 1 223.0
Spectrum Gain Events:
Sort
Detector # Gain Time
1 Detector 1 6 4.0
2 Detector 1 1 140.0
3 Detector 1 5 169.0
OK
Cancel

4. View or edit data.

**NOTICE**

**To add a new timed event, move the cursor to the last table cell (last row, last column) and press the ENTER key.**


Integration Events:
1 Inhibit ON 1 0.0
2 Slope Sens 8 1 3.0
3 Peak Width 4 1 8.0
4 Inhibit OFF 1 26.0
5 Inhibit ON 1 36.0
6 Inhibit OFF 1 46.0
7 Inhibit ON 1 97.0
8 Peak Width 8 1 100.0
9 Inhibit OFF 1 101.0
10 Inhibit ON 1 139.0
11 Integrate 3 1 143.0
12 Summation OFF 1 146.0
13 Auto Zero ON 1 170.0
14 Slope Sens 8 1 173.0
15 Peak Width OFF 1 174.0
16 Inhibit ON 1 223.0

Use the check boxes to toggle the listed sample valves ON or OFF.

Double-click a given table cell or use one of the edit function buttons to make your changes. Some table cells will change into pull-down menus when selected. Choose your data from the pull-down menu provided.

5. To sort data based on time, click the Sort button for the corresponding table.

6. Click the OK button to accept your changes and return to the main window.

**NOTICE**

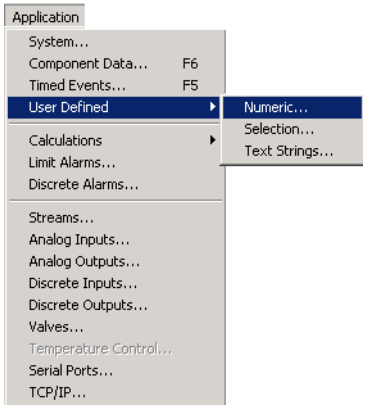
**If you configure duplicate TEVs (i.e., 2 or more TEVs contain the same parameter settings), an error dialog will display but your data will be saved.**

Click the Cancel button to abort and return to the main window.

## 5.4 USER DEFINED

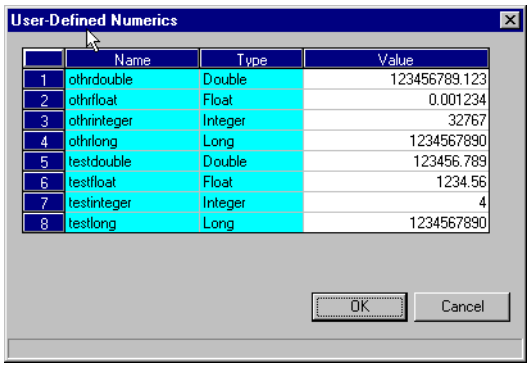
The user-defined functions allow you to edit a user-defined operator entry for an application-specific variable. These variables may be used in reports, calculations, and/or for controlling the GC operations; however, user-defined variables are not used by all applications.

### 5.4.1 Numeric




Use this function to edit values for defined initialized variables. The User Defined Numerics dialog defines the names, types, and values for all application-specific numeric variables.

1. Use the *Application* > *User Defined* > *Numerics* menu to access this function.
2. The User-Defined Numerics dialog appears.




Double-click the desired Value cell and type the new number.

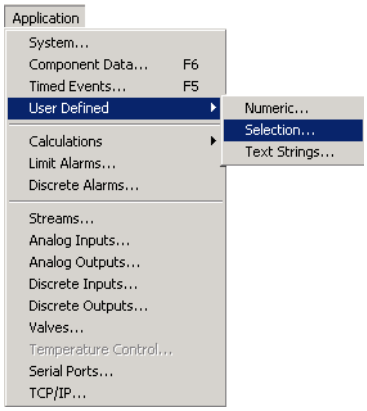
3. Click the OK button to accept your changes and return to the main window.

   Click the Cancel button to abort and return to the main window.

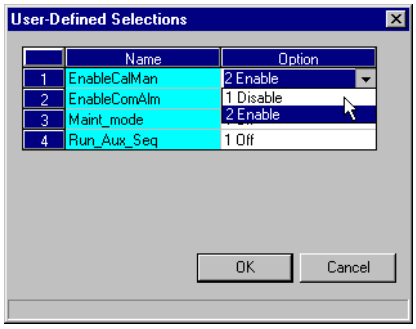
### 5.4.2 Selection

Use this function to edit values for defined selection variables. The User Defined Selections dialog defines the names and values for all application-specific selection variables.

1. Use the *Application* > *User Defined* > *Selection* menu to access this function.




2. The User-Defined Selections dialog appears.




   Double-click the desired Option cell and use the provided pull-down menu to select the new setting.

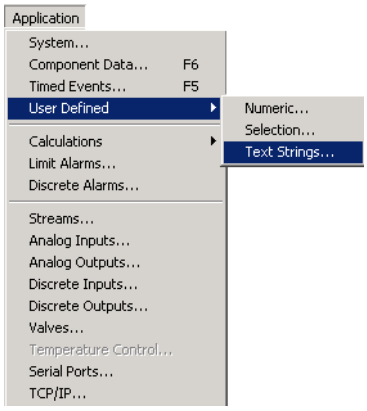
3. Click the OK button to accept your changes and return to the main window.

   Click the Cancel button to abort and return to the main window.

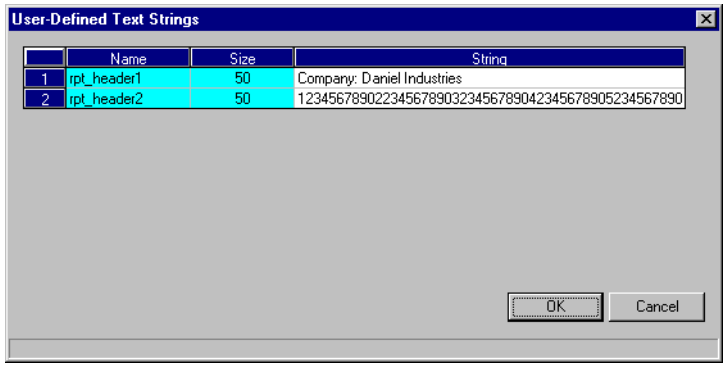
### 5.4.3 Text Strings

Use this function to edit text strings for defined string variables that may be used in reports. The User Defined Text Strings dialog defines the symbol name, size, and assigned text string for all application-specific text variables.

1. Use the *Application* > *User Defined* > *Text Strings* menu to access this function.



2. The User-Defined Text Strings dialog appears.




Double-click the desired String cell and type the new text.

**NOTICE**

**String length (i.e., how many characters you can enter) is limited to the number cited in the Size cell.**

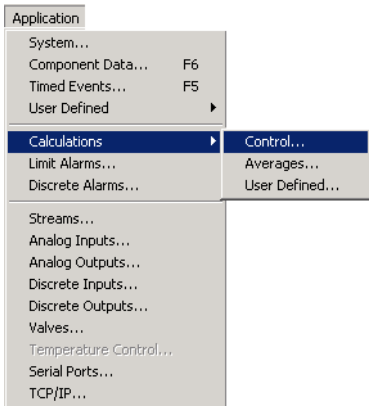
3. Click the OK button to accept your changes and return to the main window.

   Click the Cancel button to abort and return to the main window.

## 5.5 CALCULATIONS

These options allow you to activate and define how the output of standard or user-defined chromatograph analysis data is used in various calculations.

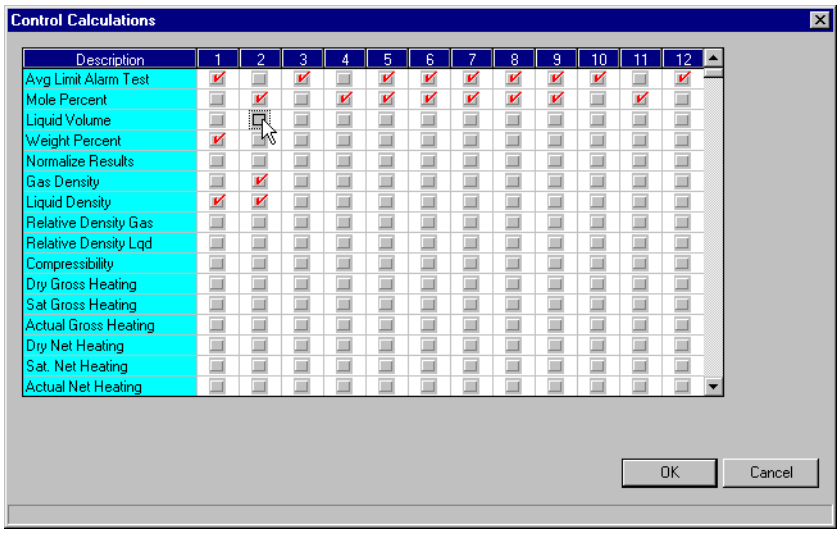
### 5.5.1 Control




Use this function to designate, by streams, the standard calculations (e.g., mole percent, liquid volume, gas density, Wobbe index, etc.) that should be performed from the GC analysis data. Calculations are enabled or disabled for each sample stream.

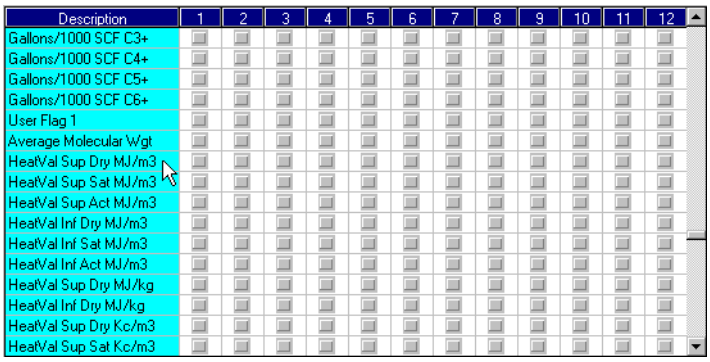
1. Use the *Application* > *Calculations* > *Control* menu to access this function.

2. The Control Calculations dialog appears.




Click the check boxes to toggle a calculation ON or OFF for a given stream.

Scroll towards the end of the list to set metric calculations.




Before enabling a metric calculation, ensure that you also enable the Metric Base Conditions setting in the Systems dialog (see Section 5.1).

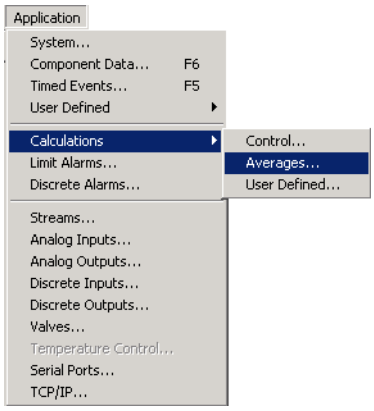
**NOTICE**

**You can use the arrow keys to move from one Stream cell to another, and press the space bar to toggle the calculation.**

3. Click the OK button to accept your selections and return to the main window.

   Click the Cancel button to abort and return to the main window.

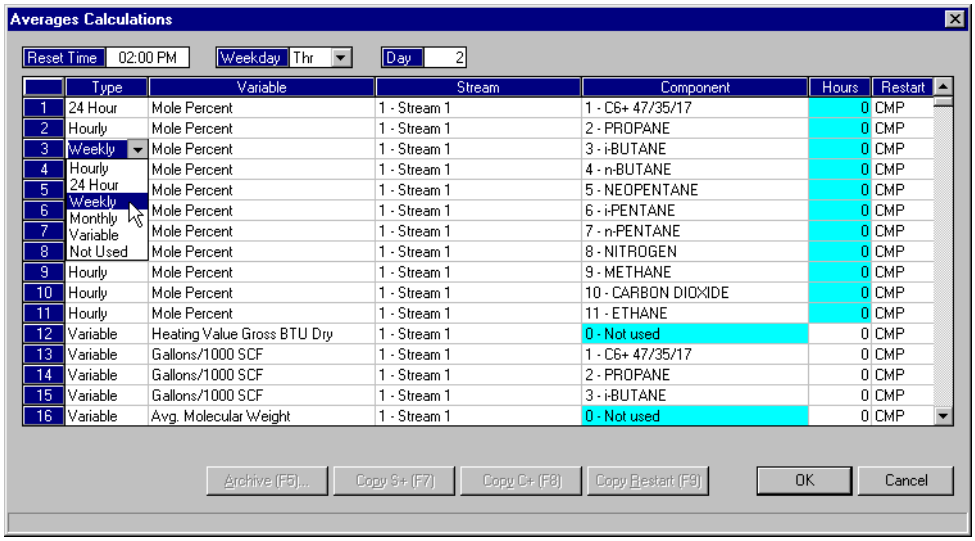
### 5.5.2 Averages




Use this function to designate, by streams and components, averages of standard calculations MON2000 should perform.

1. Use the *Application* > *Calculations* > *Averages* menu to access this function.
2. The Averages Calculations dialog appears.

   Double-click the desired cell and either type the new data or use the provided pull-down menu to select the new setting.


Averages Calculations
Reset Time 02:00 PM
Weekday Thr
Day 2
Type Variable Stream Component Hours Restart
1 24 Hour Mole Percent 1 - Stream 1 1 - C6+ 47/35/17 0 CMP
2 Hourly Mole Percent 1 - Stream 1 2 - PROPANE 0 CMP
3 Weekly Mole Percent 1 - Stream 1 3 - i-BUTANE 0 CMP
4 Hourly Mole Percent 1 - Stream 1 4 - n-BUTANE 0 CMP
5 24 Hour Mole Percent 1 - Stream 1 5 - NEOPENTANE 0 CMP
6 Weekly Mole Percent 1 - Stream 1 6 - i-PENTANE 0 CMP
7 Monthly Mole Percent 1 - Stream 1 7 - n-PENTANE 0 CMP
8 Variable Mole Percent 1 - Stream 1 8 - NITROGEN 0 CMP
9 Not Used Mole Percent 1 - Stream 1 9 - METHANE 0 CMP
10 Hourly Mole Percent 1 - Stream 1 10 - CARBON DIOXIDE 0 CMP
11 Hourly Mole Percent 1 - Stream 1 11 - ETHANE 0 CMP
12 Variable Heating Value Gross BTU Dry 1 - Stream 1 0 - Not used 0 CMP
13 Variable Gallons/1000 SCF 1 - Stream 1 1 - C6+ 47/35/17 0 CMP
14 Variable Gallons/1000 SCF 1 - Stream 1 2 - PROPANE 0 CMP
15 Variable Gallons/1000 SCF 1 - Stream 1 3 - i-BUTANE 0 CMP
16 Variable Avg. Molecular Weight 1 - Stream 1 0 - Not used 0 CMP
Archive (F5)...
Copy 9+ (F7)
Copy C+ (F8)
Copy Restart (F9)
OK
Cancel

When changing the reset time, note the following:

| Average | Setting Used |
|---|---|
| Hourly | Reset Time |
| 24-Hour | Day, Reset Time |
| Weekly | Weekday |
| Monthly | Day, Reset Time |

To set a custom time interval per calculation, set the *Type* to Variable and enter the desired interval length in the *Hours* cell. A setting of "0" means an average calculation will be performed for each analysis run of that stream.

**NOTICE**

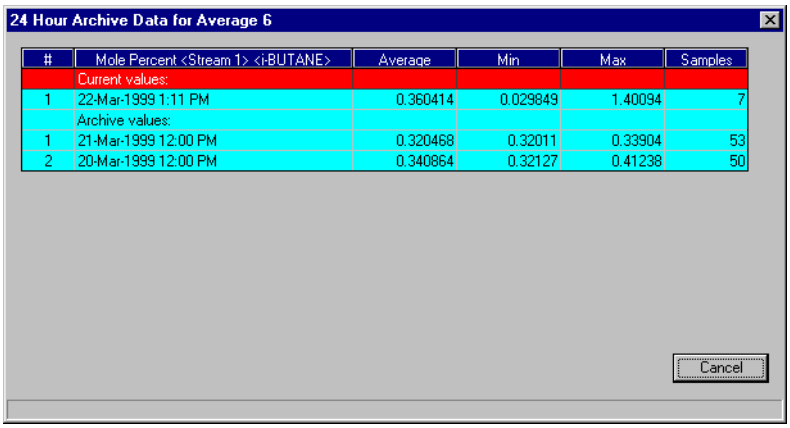
**Any GC analysis variable with defined alarm limits cannot be averaged or archived while in an active alarm state (see Section 5.6 for more information on Limit Alarms).**

**To disable this feature, use the Control Calculations function to set Avg Limit Alarm Test to OFF (see Section 5.5.1).**

Note that this custom Hours setting overrides the Reset Time setting.

3. Use the provided pull-down menu to add a new variable to the list.
4. To view an archive of averages for a given variable, select the desired variable and click the Archive (F5)... button or press the F5 key.

   The Archive Data dialog for that variable appears.


24 Hour Archive Data for Average 6
# | Mole Percent <Stream 1> <i-BUTANE> | Average | Min | Max | Samples
Current values:
1 | 22-Mar-1999 1:11 PM | 0.360414 | 0.029849 | 1.40094 | 7
Archive values:
1 | 21-Mar-1999 12:00 PM | 0.320468 | 0.32011 | 0.33904 | 53
2 | 20-Mar-1999 12:00 PM | 0.340864 | 0.32127 | 0.41238 | 50
Cancel

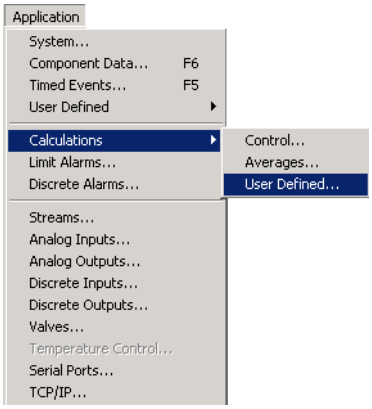
**NOTICE**

**An error message displays when the last available stream or component is reached.**

To save this archive to disk, right-click the archive table and select the Save Sheet option from the pop-up menu.

5. To copy the stream settings from a highlighted row and apply them to the next row, click the Copy S+ (F7) button or press the F7 key. This feature also increments the *Stream* value to the next available stream (e.g., incrementing from Stream 2 to Stream 8), per the GC application.
6. To copy the component settings from a highlighted row and apply them to the next row, click the Copy C+ (F8) button or press the F8 key. This feature also increments the *Component* value to the next available component (e.g., incrementing from "Ammonia" to "Benzene"), per the GC application.
7. To copy the *Restart* setting from a highlighted row and apply it to the next row, click the Copy Restart (F9) button or press the F9 key.
8. Click the OK button to accept your selections and return to the main window.

   Click the Cancel button to abort and return to the main window.

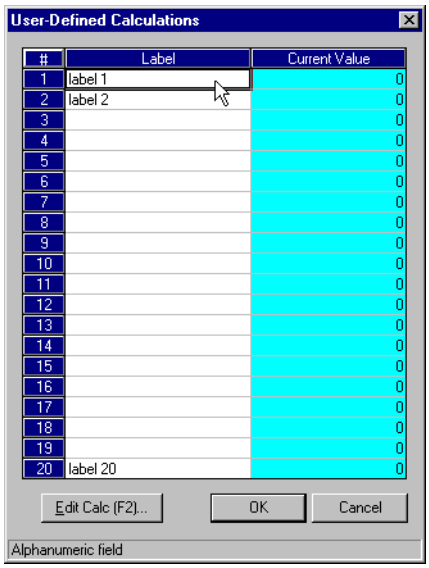



### 5.5.3 User Defined

Use this function to create and edit customized calculations on GC analysis data. MON2000 will allow up to 20 user-defined calculations.

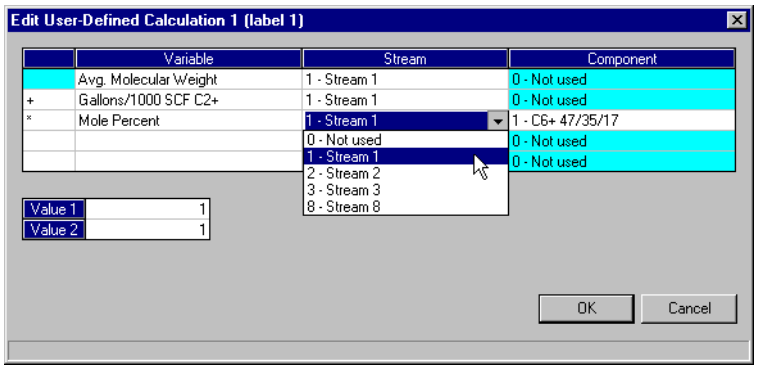
1. Use the *Application* > *Calculations* > *User Defined* menu to access this function.

2. The User-Defined Calculations dialog appears.




3. Click the calculation name you wish to edit, or click in the next available blank Label cell. The Label field accepts 15 characters.

4. Click the Edit Calc (F2)... button to edit or create the calculation function. The Edit User-Defined Calculation dialog appears.


Edit User-Defined Calculation 1 (label 1)
Variable Stream Component
Avg. Molecular Weight 1 - Stream 1 0 - Not used
+ Gallons/1000 SCF C2+ 1 - Stream 1 0 - Not used
* Mole Percent 1 - Stream 1 1 - C6+ 47/35/17
0 - Not used
1 - Stream 1
2 - Stream 2
3 - Stream 3
8 - Stream 8
0 - Not used
0 - Not used
Value 1 1
Value 2 1
OK
Cancel

**NOTICE**

**Your user-defined calculation becomes a variable that can be used when:**

- **calculating averages**
- **assigning alarm limits**
- **calculating analog outputs**
- **generating bargraphs and reports**
- **creating other user-defined calculations**

**NOTICE**

**The calculation completes each step from top to bottom.**

(a) To change the calculation function, click the appropriate cell and use the pull-down menu to choose the desired operator.

To change or add a variable name, use the Variables pull-down menu.

To select a stream or component, click the appropriate cell and use the pull-down menu to choose the desired stream/component.

Enter any constant values in the Value 1 and Value 2 cells.

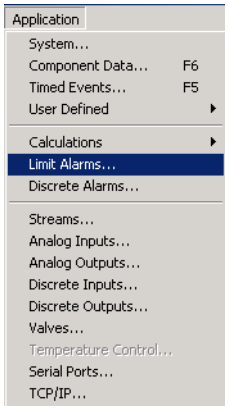
(b) Click the OK button to accept your changes and return to the User-Defined Calculation dialog.

Click the Cancel button to abort and return to the User-Defined Calculation dialog.

5. Click the OK button to accept your new or edited calculation and return to the main window.

   Click the Cancel button to abort and return to the main window.

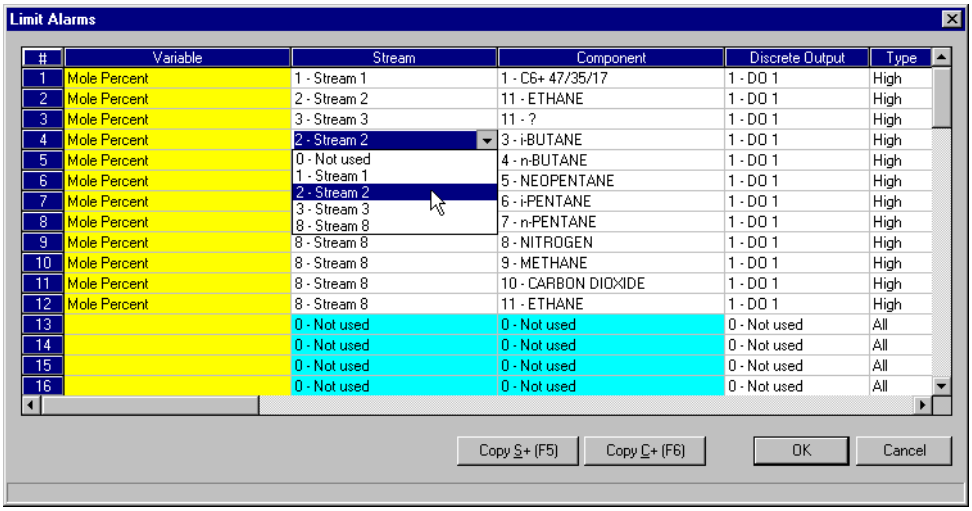
## 5.6 LIMIT ALARMS




Use this function to set threshold limits for GC analysis data. When a limit is exceeded, an alarm is activated and logged. See Section 8.3 for information on Alarm Logs.

Note that Modbus Registers assigned to alarms are application-specific.

1. Use the *Application* > *Limit Alarms* menu to access this function.
2. The Limit Alarms dialog appears.


Limit Alarms
# | Variable | Stream | Component | Discrete Output | Type
1 | Mole Percent | 1 - Stream 1 | 1 - C6+ 47/35/17 | 1 - DO 1 | High
2 | Mole Percent | 2 - Stream 2 | 11 - ETHANE | 1 - DO 1 | High
3 | Mole Percent | 3 - Stream 3 | 11 - ? | 1 - DO 1 | High
4 | Mole Percent | 2 - Stream 2 | 3 - i-BUTANE | 1 - DO 1 | High
5 | Mole Percent | 0 - Not used | 4 - n-BUTANE | 1 - DO 1 | High
6 | Mole Percent | 1 - Stream 1 | 5 - NEOPENTANE | 1 - DO 1 | High
7 | Mole Percent | 2 - Stream 2 | 6 - i-PENTANE | 1 - DO 1 | High
8 | Mole Percent | 3 - Stream 3 | 7 - n-PENTANE | 1 - DO 1 | High
9 | Mole Percent | 8 - Stream 8 | 8 - NITROGEN | 1 - DO 1 | High
10 | Mole Percent | 8 - Stream 8 | 9 - METHANE | 1 - DO 1 | High
11 | Mole Percent | 8 - Stream 8 | 10 - CARBON DIOXIDE | 1 - DO 1 | High
12 | Mole Percent | 8 - Stream 8 | 11 - ETHANE | 1 - DO 1 | High
13 | | 0 - Not used | 0 - Not used | 0 - Not used | All
14 | | 0 - Not used | 0 - Not used | 0 - Not used | All
15 | | 0 - Not used | 0 - Not used | 0 - Not used | All
16 | | 0 - Not used | 0 - Not used | 0 - Not used | All
Copy S+ (F5)
Copy C+ (F6)
OK
Cancel

3. To change the assigned variable, stream or component, click the appropriate cell and use the provided pull-down menu.

   Note that you must first select a variable before entering the related data.

4. To assign the discrete hardware output that will be set when the alarm is active, click in the appropriate cell and use the provided pull-down menu.

   Output values range from “1” to “N”, per the discrete hardware output identification number and the GC application. A discrete

**NOTICE**

**You can add a new variable only if an available row is blank. The number of allowed limit alarms is fixed by the GC application.**

output of "0 - Not used" indicates that no output is set.

**NOTICE**

**A discrete output can be used to monitor one or more inputs.**

**If you are using discrete outputs to reflect the status of discrete inputs, ensure that the output assignments set here coordinate with those set in the Discrete Alarms dialog (see Section 5.7).**

To set discrete outputs, see Section 5.12.

5. To change the alarm type, click the appropriate cell and use the provided pull-down menu.

| Type | Purpose |
|---|---|
| All | use all 4 limits (both Low and both High) |
| High | use only High and High-High limits |
| Low | use only Low and Low-Low limits |

6. Input the desired high/low limits in the appropriate cells.

**NOTICE**

**An error message displays when the last available stream or component is reached.**

7. To copy the stream settings from a highlighted row and apply them to the next row, click the Copy S+ (F5) button or press the F5 key. This feature increments the Stream value to the next available stream (e.g., incrementing from "Stream 2" to "Stream 8"), per the GC application.

8. To copy the component settings from a highlighted row and apply them to the next row, click the Copy C+ (F6) button or press the F6 key. This feature increments the Component value to the next available component (e.g., incrementing from "Ammonia" to "Benzene"), per the GC application.

9. Click the OK button to accept your changes and return to the main window.

   Click the Cancel button to abort and return to the main window.

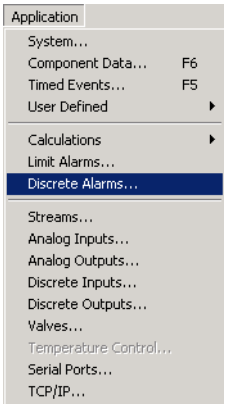
**Limit Alarms Description**

- Variable - selected variable assigned to the limit alarm
- Stream - stream number assigned to the variable or the channel number if an analog input or analog output
- Component - component name and number assigned to the variable
- Discrete Output - number of the discrete hardware output that will be set when the alarm is active; zero indicates no discrete output will be set

- Type - High uses only the high and the high-high limits, Low uses only the low and the low-low limits, and All uses both low and both high limits

| Type | Purpose |
|---|---|
| Low-Low | If the variable value falls below this limit, the low-low limit alarm is activated. This alarm is for extreme situations |
| Low | If the variable value falls below this limit, the low limit alarm is activated. |
| High | If the variable value rises above this limit, the high limit alarm is activated. |
| High-High | If the variable value rises above this limit, the high-high limit alarm is activated. This alarm is for extreme situations. |

## 5.7 DISCRETE ALARMS

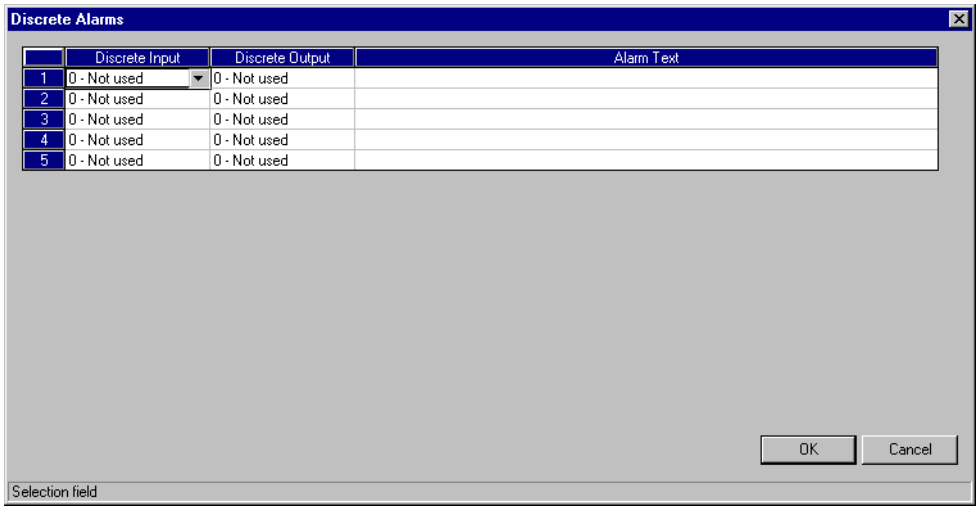



Use this function to assign discrete hardware inputs, used to set alarms, to one of the available discrete hardware outputs.

For more information on discrete outputs, see Section 5.12.

1. Use the *Application* > *Discrete Alarms* menu to access this function.

2. The Discrete Alarms dialog appears.


Discrete Alarms
Discrete Input
Discrete Output
Alarm Text
1 0 - Not used 0 - Not used
2 0 - Not used 0 - Not used
3 0 - Not used 0 - Not used
4 0 - Not used 0 - Not used
5 0 - Not used 0 - Not used
OK
Cancel
Selection field

3. Use the provided Discrete Input pull-down menu to select the identification number of the discrete hardware input to be used for alarm purposes.

   Input values can range from "1" to "N", per the discrete hardware output identification number and the GC application. A discrete input of "0 - Not used" indicates that no input has been assigned.

   To configure discrete inputs, see Section 5.11.

**NOTICE**

**All alarms from digital inputs with assignments other than "0" are recorded in the Alarm Log.**

4. Use the provided Discrete Output pull-down menu to select the identification number of

the discrete hardware output to be used for alarm purposes.

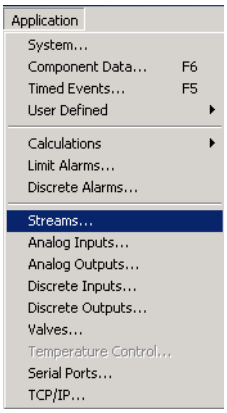
**NOTICE**

**A discrete output can be used to monitor one or more inputs.**

**If you are using discrete outputs to reflect the status of GC analysis data alarms, ensure that the output assignments set here coordinate with those set in the Limit Alarms dialog (see Section 5.6).**

Output values can range from "1" to "N", per the discrete hardware output identification number and the GC application. A discrete output of "0 - Not used" indicates that no output has been assigned. To configure discrete outputs, see Section 5.12.

## 5.8 STREAMS

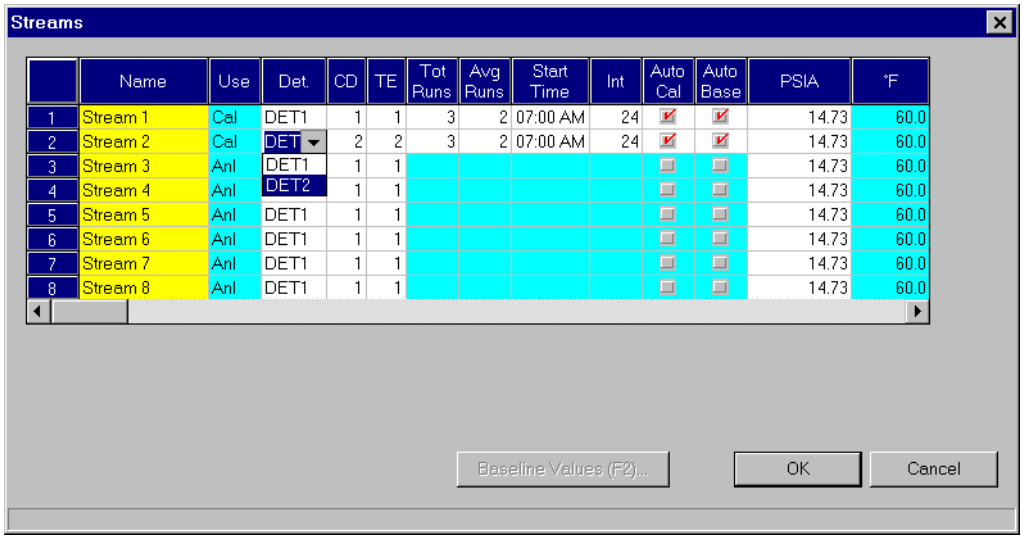



This function allows you to:

- assign CDTs and TEVs to a particular stream
- designate a stream for analysis or calibration (or none)
- control automatic calibration parameters, such as the total number of runs, runs to be averaged, starting times, and time between automatic calibrations and baseline runs
- define baseline pressure and temperature conditions that are applicable to calculated GC analysis data, such as compressibility

To use the Streams function,

1. Use the *Application* > *Streams* menu to access this function.
2. The Streams dialog appears.


Streams
Name
Use
Det.
CD
TE
Tot Runs
Avg Runs
Start Time
Int
Auto Cal
Auto Base
PSIA
°F
1 Stream 1 Cal DET1 1 1 3 2 07:00 AM 24 14.73 60.0
2 Stream 2 Cal DET 2 2 3 2 07:00 AM 24 14.73 60.0
3 Stream 3 Anl DET1 1 1 14.73 60.0
4 Stream 4 Anl DET2 1 1 14.73 60.0
5 Stream 5 Anl DET1 1 1 14.73 60.0
6 Stream 6 Anl DET1 1 1 14.73 60.0
7 Stream 7 Anl DET1 1 1 14.73 60.0
8 Stream 8 Anl DET1 1 1 14.73 60.0
Baseline Values (F2)...
OK
Cancel

3. To edit the settings displayed, click the appropriate cell, use the provided pull-down menus, or to choose the check boxes to enable or disable the automatic calibration and baseline calibration.

   See the following tables for details.

The **standard settings** include:

*Table 5-4 Description of Standard Stream Settings*

| Std Setting | Description |
|---|---|
| <Number> | number label assigned by MON2000<br><br>This number correlates with the stream switch. A maximum of 12 streams can be controlled by MON2000 and a standard GC application. |
| Name | text string label to identify a stream (12 character maximum) |
| Use | how stream is used<br><br>Settings include: calibration (CAL); analysis (ANL); not used (NOT) |
| Det | detector used by this stream<br><br>Control of the detector is application-specific. For example,<br><br>• for Model 700/2350A, Modes 0 and 1, the Det col is “DET1” and read-only<br>• for Model 700/2350A, Mode 2, the Det col is editable<br>• for Model 700/2350A, Mode 3, the Det col is “DUAL” and read-only |
| CD | CDT associated with this stream (see Section 5.2) |
| CD2 | CDT 2 For the Model 700/2350A Modes 2 and 3, an additional CD column displays. |
| TE | TEV associated with this stream (see Section 5.3) |
| TE2 | TEV 2 For the Model 700/2350A Modes 2 and 3, an additional TE column displays. |

For **calibration (CAL) streams**, you can edit the following control parameters:

*Table 5-5 Description of Calibration Stream Settings*

| Cal Setting | Description |
|---|---|
| Tot | number of runs made for each calibration<br><br>Range: 1 to 10 |
| Avg | number of last calibration runs to average<br><br>E.g., if 5 calibration runs are performed and *Avg* is set to "3", then the last 3 runs are used to average the calibration results. |
| Start | time the first automatic calibration is to be performed |
| Int | number of hours between automatic calibrations |

*Table 5-5 Description of Calibration Stream Settings (Continued)*

| Cal Setting | Description |
|---|---|
| Auto Cal<br>Auto Base | enable/disable the automatic calibration and baseline run (first check box sets the automatic calibration; second check box sets the baseline run)<br><br>**NOTICE**<br><br>**For the automatic calibration to work, at least one stream switch (valve event Strm Sw) must be included in the corresponding TEV (see Section 5.3).**<br><br>If the automatic baseline run is enabled, the GC performs an additional calibration run (before the calibration runs to be averaged) without the calibration gas. This run evaluates peaks caused by the GC valve action alone; any peak areas found are subtracted from the subsequent analyses. To view or print the baseline run results, see Step 4.<br><br>**NOTICE**<br><br>**Disabling the Auto Base setting will delete existing CDT baseline data for the associated stream.** |

You can edit the following parameters for a defined stream used in **GC calculations**. These parameters are also used for post-analysis calculations that use stream-specific base pressure and temperature values. Note that these parameters are not applicable for every application.

*Table 5-6 Description of GC Calculation Parameters*

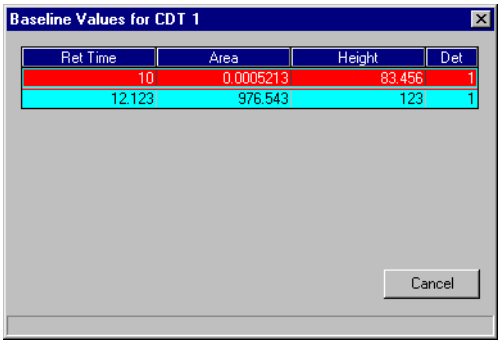
| Par Setting | Description |
|---|---|
| PSIA<br>BAR | base temperature in PSIA or bar units<br>**NOTICE**<br>**To change the displayed system units, see Section 5.1 for details.** |
| deg F<br>deg C | base temperature in degrees Fahrenheit or Celsius |
| Opt Pres 1<br>Opt Pres 2<br>Opt Pres 3 | If compressibility is activated for a particular stream (Calculation Control function, (see Section 5.5.1), up to 3 optional pressures can be defined to calculate additional post-analysis data. |

Only the base pressure can be edited. The base temperature is a constant 6 °F (15 °C) for all calculations.

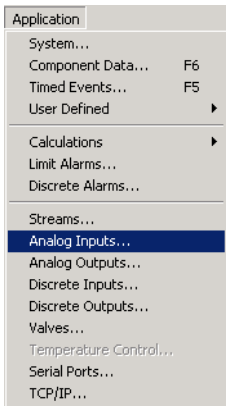
4. To view or print the baseline run results, click the Baseline Values (F2)... button or press the F2 key. The Baseline Values dialog appears.

**NOTICE**

**If a stream is not used, you cannot access baseline data for that stream.**




5. Click the Cancel button to return to the main window.




## 5.9 ANALOG INPUTS

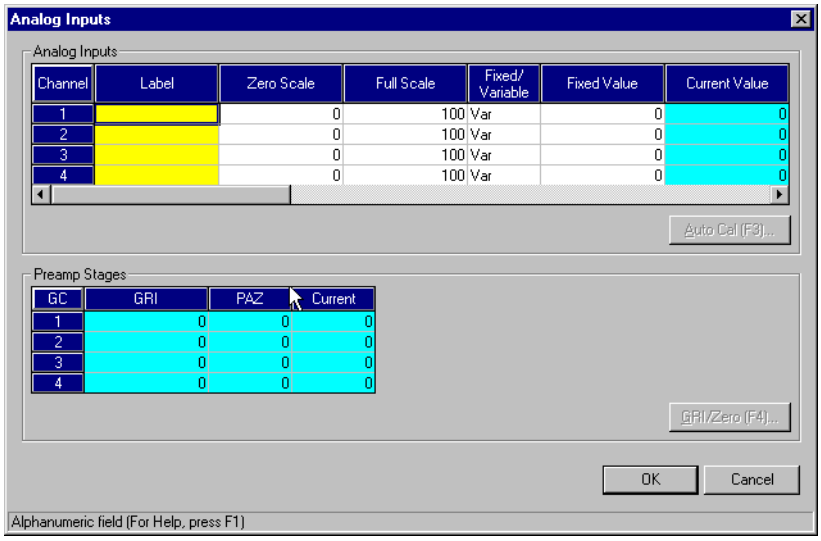
This function allows you to:

- assign identifying labels
- assign scale ranges
- calibrate analog inputs for zero and full scale values

Electrical current signals ranging from 4 to 20mA (±10 %) are accepted as analog inputs.

To use the Analog Inputs function,

1. Use the *Application* > *Analog Inputs* menu to access this function.
2. The Analog Inputs dialog appears.




To edit the settings displayed, click the appropriate cell or click and use the provided pull-down menus.

**NOTICE**

**The 2350A GC Controller and the Model 700 unit supports up to four AI channels.**

See the following table for details or refer to Step 3 for a more automated process.

*Table 5-7 Description of Analog Input Settings*

| Setting | Description |
|---|---|
| Channel | channel number assigned<br><br>Number of available analog inputs is dependent upon the GC Controller model. |
| Label | name used to identify the analog input (12 characters maximum) |
| Zero Scale | value used as the zero scale when converting the analog input value |
| Full Scale | value used as the full scale when converting the analog input value |
| Fixed/Variable | analog input operation mode<br><br>FXD = fixed<br>VAR = variable<br><br>If the operation mode is fixed, the analog input is set to the number entered for the Fixed Value. |
| Fixed Value | analog input value used during fixed operation |
| Current Value | current readout values of the analog inputs (values reflect scale assignments) |
| GC<br>GRI<br>PAZ | Gain Ratio Index (GRI) and Preamp Zero (PAZ) readouts from the GC preamplifier's 4 stages; use as a troubleshooting aid<br>Normal preamp stage (gain) operating ranges for Models 500, 700 and 1000 GC units are shown in Table 5-8 below. |
| Zero Scale Calib Adjustment mA | calibrated analog inputs for known zero scale electrical current levels |
| Full Scale Calib Adjustment mA | calibrated analog inputs for known full scale electrical current levels |

**NOTICE**

**MON2000 accepts a Zero Scale calibration value that is higher than the Full Scale value.**

**A higher Zero Scale value can be useful in applications that require an inverse display, or record of analog signal levels.**

*Table 5-8 Gain Operating Ranges for Models 500, 700 and 1000 GCs*

| GC | GRI | PAZ (12-bit AD) | Value (12-bit AD) | PAZ (16-bit AD) | Value (16-bit AD) |
|---|---|---|---|---|---|
| 1 | 0.0 to 0.0 | 600 to 800 | 0 to 4095 | 4800 to 6400 | -32767 to 32767 |
| 2 | 0.8 to 1.1 | 600 to 800 | 0 to 4095 | 4800 to 6400 | -32767 to 32767 |
| 3 | 0.8 to 1.1 | 600 to 800 | 0 to 4095 | 4800 to 6400 | -32767 to 32767 |
| 4 | 0.8 to 1.1 | 1150 to 1500 | 0 to 4095 | 9200 to 12000 | -32767 to 32767 |

3. To perform an automated input calibration,
   (a) Select the desired channel by clicking anywhere in that row.
   (b) Set the analog input signal to either its minimum level or the anticipated Zero Value.

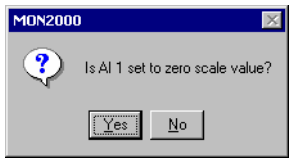
**NOTICE**

**This step may require adjusting a rheostat, or another controlling device, at the source of the analog input signal.**

   (c) Set the anticipated Full Value.
   (d) Click the Auto Cal (F3)... button or press the F3 key.

   You can abort this process at any time by clicking the No button.

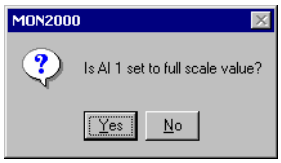
4. The Zero Scale Adjustment dialog appears.




Click the Yes button to continue.

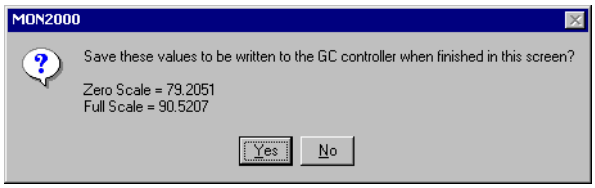
MON2000 accepts a Zero Scale calibration value that is higher than the Full Scale value. A higher Zero Scale value can be useful in the applications that require an inverse display, or record, of analog signal levels. 2350A GC Controllers and Model 700 units support up to 4 Analog channels.

5. The Full Scale Adjustment dialog appears. Adjust the Analog Input to its Full Scale value.




Click the Yes button to continue.

6. MON2000 verifies that the recorded values are acceptable. A confirmation dialog displays.


MON2000
Save these values to be written to the GC controller when finished in this screen?
Zero Scale = 79.2051
Full Scale = 90.5207
Yes
No

Click the Yes button to accept your changes.

Click the No button to cancel and return to the Analog Input dialog.

7. To perform a GRI (Gain Ratio Index) calculation, click the GRI/Zero (F4)... button or press the F4 key.

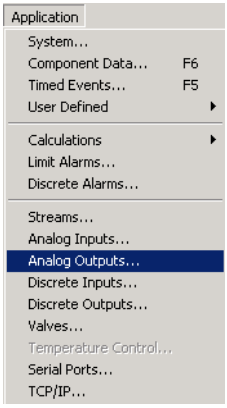
A GRI calculation confirms the GC Controller preamp operation. It can be performed after a preamp calibration has been completed, or as a trouble shooting procedure.

**NOTICE**

**Ensure that you halt any ongoing analysis runs (see Section 4.3) before performing a GRI calculation.**

8. Click the OK button to accept your changes and return to the main window.

   Click the Cancel button to abort and return to the main window.




## 5.10 ANALOG OUTPUTS

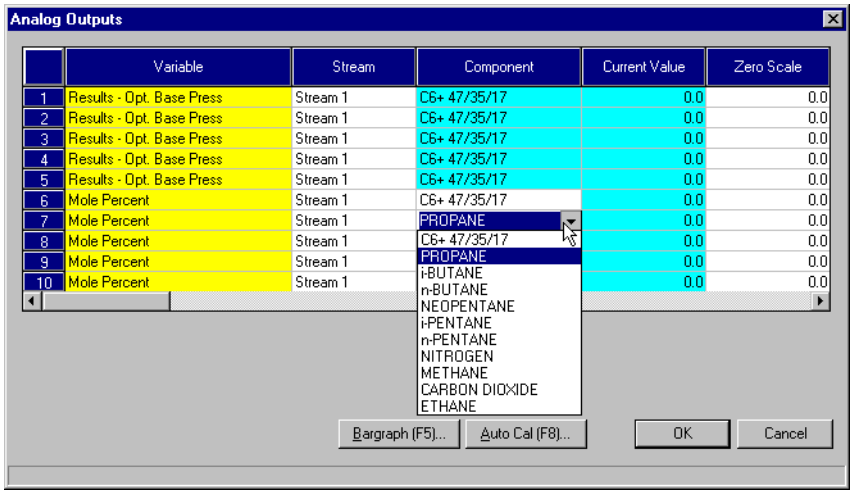
This function allows you to:

- assign variables to Analog Outputs
- assign scale ranges
- calibrate analog outputs for zero and full scale values

### 5.10.1 Analog Output Dialog Description

To use the Analog Outputs function,

1. Use the *Application* > *Analog Outputs* menu to access this function.
2. The Analog Outputs dialog appears.


Analog Outputs
Variable
Stream
Component
Current Value
Zero Scale
1 Results - Opt. Base Press Stream 1 C6+ 47/35/17 0.0 0.0
2 Results - Opt. Base Press Stream 1 C6+ 47/35/17 0.0 0.0
3 Results - Opt. Base Press Stream 1 C6+ 47/35/17 0.0 0.0
4 Results - Opt. Base Press Stream 1 C6+ 47/35/17 0.0 0.0
5 Results - Opt. Base Press Stream 1 C6+ 47/35/17 0.0 0.0
6 Mole Percent Stream 1 C6+ 47/35/17 0.0 0.0
7 Mole Percent Stream 1 PROPANE 0.0 0.0
8 Mole Percent Stream 1 0.0 0.0
9 Mole Percent Stream 1 0.0 0.0
10 Mole Percent Stream 1 0.0 0.0
C6+ 47/35/17
PROPANE
i-BUTANE
n-BUTANE
NEOPENTANE
i-PENTANE
n-PENTANE
NITROGEN
METHANE
CARBON DIOXIDE
ETHANE
Bargraph (F5)...
Auto Cal (F8)...
OK
Cancel

To edit the settings displayed, double-click the appropriate cell or click and use the provided pull-down menus.

**NOTICE**

**When assigning analog outputs, first check the CGM Analog Output Config field in the System dialog (see Section 5.1).**

**An analog output assignment that uses the same analog output number as the CGM setting will produce erratic CGM trace output, possibly with incorrect scaling.**

See the following table for details.

*Table 5-9 Description of Analog Output Settings*

| Setting | Description |
|---|---|
| <Number> | number assigned to Analog Output<br><br>Number of available analog outputs is dependent upon the GC Controller model.<br><br>**NOTICE**<br><br>**If the GC unit includes a Daniel Analog Expansion Module (AEM), P/N 1-0500-001, reserve analog output number 1 (first row) for the variable Bargraph.** |
| Variable | type of GC analysis data on which to base signal level of analog output |
| Stream | stream number assigned to the variable or the channel number if referencing an analog output |
| Component | name of component monitored by this output |
| Current Value | current readout values of the analog output (values reflect scale assignments) |

*Table 5-9 Description of Analog Output Settings (Continued)*

| Setting | Description |
|---|---|
| Zero Scale | value used to represent the minimum value (4mA) when scaling the analog output value |
| Full Scale | value used to represent the maximum value (20mA) when scaling the analog output value |
| Fixed/Var | analog output operation mode<br><br>Fixed = fixed<br>Var = variable<br><br>If the operation mode is fixed, the analog output is set to the number entered for the Fixed Value. |
| Fixed Value | analog output value used during fixed operation |
| Zero Adjustment | value used to correct Zero Scale |
| Full Adjustment | value used to correct Full Scale |

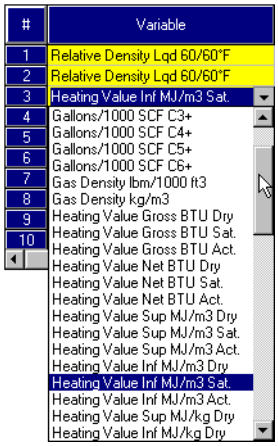
**NOTICE**

**When defining a new analog output, perform a calibration first to obtain accurate Zero and Full Adjustment values (see Section 5.10.4 or Section 5.10.5).**

3. Click the OK button to accept your changes and return to the main window.

   Click the Cancel button to abort and return to the main window.

### 5.10.2 Changing a Variable


#
Variable
1 Relative Density Lqd 60/60°F
2 Relative Density Lqd 60/60°F
3 Heating Value Inf MJ/m3 Sat.
4 Gallons/1000 SCF C3+
5 Gallons/1000 SCF C4+
6 Gallons/1000 SCF C5+
7 Gallons/1000 SCF C6+
8 Gas Density lbm/1000 ft3
9 Gas Density kg/m3
10 Heating Value Gross BTU Dry
Heating Value Gross BTU Sat.
Heating Value Gross BTU Act.
Heating Value Net BTU Dry
Heating Value Net BTU Sat.
Heating Value Net BTU Act.
Heating Value Sup MJ/m3 Dry
Heating Value Sup MJ/m3 Sat.
Heating Value Sup MJ/m3 Act.
Heating Value Inf MJ/m3 Dry
Heating Value Inf MJ/m3 Sat.
Heating Value Inf MJ/m3 Act.
Heating Value Sup MJ/kg Dry
Heating Value Inf MJ/kg Dry

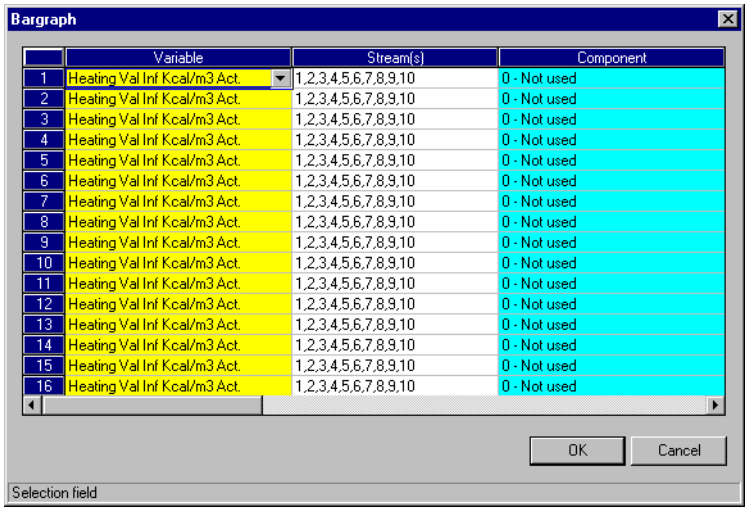
To change a variable assignment, click the appropriate Variable cell. Use the provided pull-down menu and click the desired variable to select it.

### 5.10.3 Changing the Bargraph

Use this function to designate which AEM output analog signals can be used to drive the bargaph device inputs. Each of the 16 available AEM output signals can be assigned to represent various GC analysis data variables.

To edit the variables and corresponding settings displayed by the bargraph,

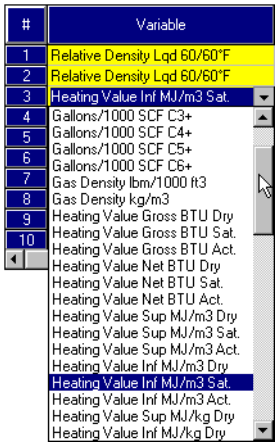
1. Click the Bargraph (F5)... button or press the F5 key.
2. The Bargraph dialog appears.


Bargraph
Variable
Stream(s)
Component
1 Heating Val Inf Kcal/m3 Act. 1,2,3,4,5,6,7,8,9,10 0 - Not used
2 Heating Val Inf Kcal/m3 Act. 1,2,3,4,5,6,7,8,9,10 0 - Not used
3 Heating Val Inf Kcal/m3 Act. 1,2,3,4,5,6,7,8,9,10 0 - Not used
4 Heating Val Inf Kcal/m3 Act. 1,2,3,4,5,6,7,8,9,10 0 - Not used
5 Heating Val Inf Kcal/m3 Act. 1,2,3,4,5,6,7,8,9,10 0 - Not used
6 Heating Val Inf Kcal/m3 Act. 1,2,3,4,5,6,7,8,9,10 0 - Not used
7 Heating Val Inf Kcal/m3 Act. 1,2,3,4,5,6,7,8,9,10 0 - Not used
8 Heating Val Inf Kcal/m3 Act. 1,2,3,4,5,6,7,8,9,10 0 - Not used
9 Heating Val Inf Kcal/m3 Act. 1,2,3,4,5,6,7,8,9,10 0 - Not used
10 Heating Val Inf Kcal/m3 Act. 1,2,3,4,5,6,7,8,9,10 0 - Not used
11 Heating Val Inf Kcal/m3 Act. 1,2,3,4,5,6,7,8,9,10 0 - Not used
12 Heating Val Inf Kcal/m3 Act. 1,2,3,4,5,6,7,8,9,10 0 - Not used
13 Heating Val Inf Kcal/m3 Act. 1,2,3,4,5,6,7,8,9,10 0 - Not used
14 Heating Val Inf Kcal/m3 Act. 1,2,3,4,5,6,7,8,9,10 0 - Not used
15 Heating Val Inf Kcal/m3 Act. 1,2,3,4,5,6,7,8,9,10 0 - Not used
16 Heating Val Inf Kcal/m3 Act. 1,2,3,4,5,6,7,8,9,10 0 - Not used
OK
Cancel
Selection field

To edit the settings displayed, double-click the appropriate cell or click and use the provided pull-down menus. See Section 5.10.1 for more details.

**NOTICE**

**Multiple streams can be entered by separating the stream numbers with commas (e.g., 2,3). Bargraph results will be produced for each stream.**


#
Variable
1 Relative Density Lqd 60/60°F
2 Relative Density Lqd 60/60°F
3 Heating Value Inf MJ/m3 Sat.
4 Gallons/1000 SCF C3+
5 Gallons/1000 SCF C4+
6 Gallons/1000 SCF C5+
7 Gallons/1000 SCF C6+
8 Gas Density lbm/1000 ft3
9 Gas Density kg/m3
10 Heating Value Gross BTU Dry
Heating Value Gross BTU Sat.
Heating Value Gross BTU Act.
Heating Value Net BTU Dry
Heating Value Net BTU Sat.
Heating Value Net BTU Act.
Heating Value Sup MJ/m3 Dry
Heating Value Sup MJ/m3 Sat.
Heating Value Sup MJ/m3 Act.
Heating Value Inf MJ/m3 Dry
Heating Value Inf MJ/m3 Sat.
Heating Value Inf MJ/m3 Act.
Heating Value Sup MJ/kg Dry
Heating Value Inf MJ/kg Dry

3. To change a variable assignment, click the appropriate Variable cell. Use the provided pull-down menu and click the desired variable to select it.

4. Click the OK button to accept your changes and return to the Analog Outputs dialog.

   Click the Cancel button to abort and return to the Analog Outputs dialog.

### 5.10.4 Performing a Manual Calibration

To manually calibrate an analog output,

1. Select the desired analog output by clicking anywhere in the corresponding row.
2. Set the *Zero Scale* and *Full Scale* values as desired.
3. Set the *Fixed/Var* parameter to "Fixed".
4. Set *Fixed Value* equal to the Zero Scale value.
5. Set *Zero Adjustment* and *Full Adjustment* to "0.0".
6. Click the OK button to accept your changes and exit from the Analog Outputs dialog.
7. Return to the Analog Outputs dialog. Wait until the *Current Value* of the analog output is equal to the Zero Scale value (see Step 2).
8. Record the value, in engineering units, read by the receiving device (e.g., a voltmeter).
9. Set *Fixed Value* equal to the Full Scale value (see Step 2).

**NOTICE**

**Setting both adjustment values to "0.0" disables the scale adjustment.**

**See Appendix D for an alternative calibration method for analog outputs. Appendix D includes an example of calibrating an output scale of 0 to 1200.**

10. Click the OK button to accept your changes and exit from the Analog Outputs dialog.
11. Return to the Analog Outputs dialog. Wait until the *Current Value* of the analog output is equal to the Full Scale value (see Step 2).
12. Record the value, in engineering units, read by the receiving device (e.g., a voltmeter).
13. Set *Zero Adjustment* to the value recorded in Step 8.
14. Set *Full Adjustment* to the value recorded in Step 12.
15. Set the *Fixed/Var* parameter to "Var".
16. Click the OK button to complete the calibration and return to the main window.

### 5.10.5 Performing an Automated Calibration

To perform an automated analog output calibration,

1. Select the desired analog output by clicking anywhere in the corresponding row.
2. Click the Auto Cal (F8)... button or press the F8 key.

   You can abort this process at any time by clicking the Cancel button.
3. The Zero Scale Adjustment dialog appears.

**NOTICE**

**To determine the uncalibrated Zero Scale and Full Scale analog output levels, see Section 5.10.1.**

**NOTICE**

**To prevent scale adjustment, set both adjustment values to zero (0.0).**

**See Appendix D for additional instructions on calibrating analog outputs. Appendix D also includes a calibration example for an output scale of 0 to 1200.**

Input the appropriate value and click the OK button.

4. The Full Scale Adjustment dialog appears.

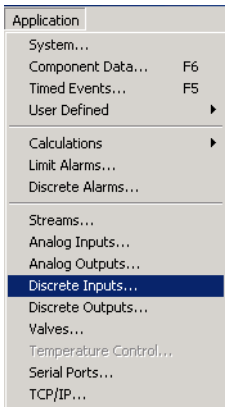
Input the appropriate value and click the OK button.

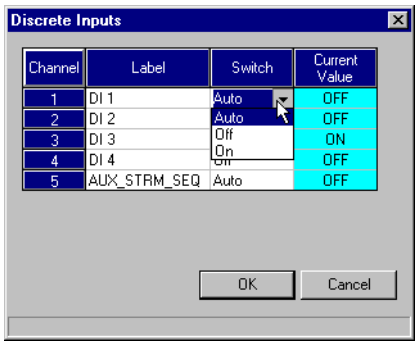
5. If the values entered are within tolerance, data in the zero and full adjustment columns is updated. Otherwise, MON2000 displays an error message.

## 5.11 DISCRETE INPUTS

Use this function to assign labels to the GC discrete inputs and control their operational modes. The number of discrete inputs available depends on the GC application.

1. Use the *Application* > *Discrete Inputs* menu to access this function.
2. The Discrete Inputs dialog appears.




To edit the settings displayed, double-click the appropriate cell or click and use the provided pull-down menus.

See the following table for details.

*Table 5-10 Description of Discrete Input Settings*

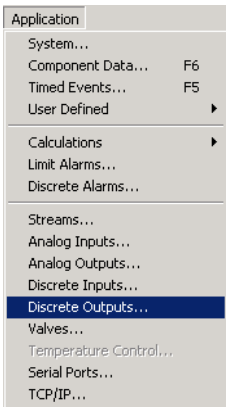
| Setting | Description |
|---|---|
| Channel | channel number assigned |
| Label | name used to identify the discrete input (12 characters maximum) |
| Switch | sets operational mode for this discrete input<br><br>Auto = value is determined by application<br>Off = value is set to OFF<br>On = value is set to ON |
| Current Value | current state of the discrete input |

3. Click the OK button to accept your changes and return to the main window.

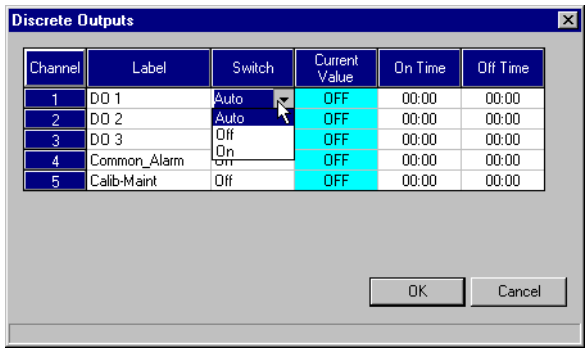
   Click the Cancel button to abort and return to the main window.

## 5.12 DISCRETE OUTPUTS

Use this function to assign labels to the GC discrete outputs and control their operational modes. The number of discrete outputs available depends on the GC application.




1. Use the *Application* > *Discrete Outputs* menu to access this function.
2. The Discrete Outputs dialog appears.




To edit the settings displayed, double-click the appropriate cell or click and use the provided pull-down menus.

**NOTICE**

**Signals routed to discrete outputs are assigned via the Limit Alarm and Discrete Alarm functions (see Section 5.6 and Section 5.7).**

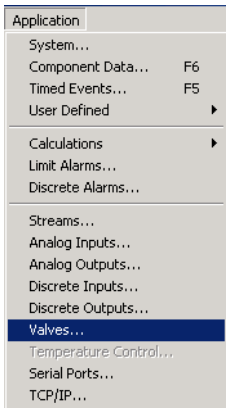
See the following table for details.

*Table 5-11 Description of Discrete Output Settings*

| Setting | Description |
|---|---|
| Channel | channel number assigned |
| Label | name used to identify the discrete output (12 characters maximum) |
| Switch | sets operational mode for this discrete output<br><br>Auto = value is determined by application<br>Off = value is set to OFF<br>On = value is set to ON |
| Current Value | current state of the discrete output |
| On Time<br>Off Time | time the digital output will be turned ON/OFF (MON2000 clock based on user PC system clock)<br><br>If the ON/OFF times are the same, the timing feature has no effect. |

3. Click the OK button to accept your changes and return to the main window.

   Click the Cancel button to abort and return to the main window.




## 5.13 VALVES

This function allows you to:

- assign identifying labels
- monitor valve operation
- control the operation modes

The number of discrete outputs available depends on the GC application.

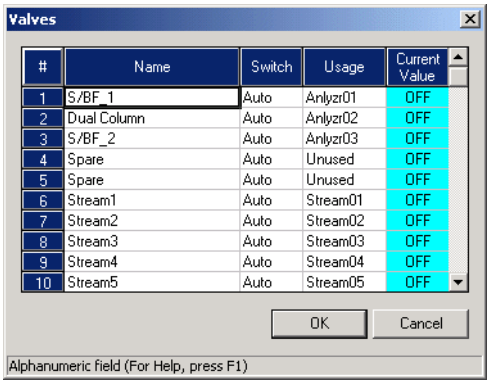
To use the Valve function,

**NOTICE**

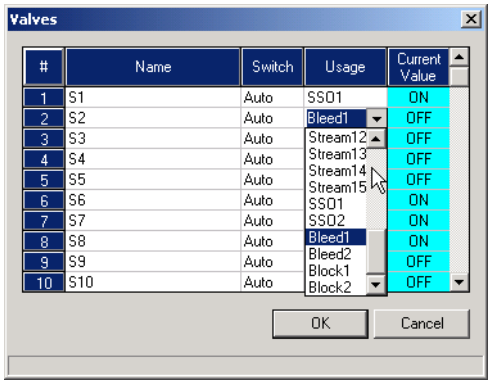
**2350A GC Controllers support up to 12 Stream valves and 5 Analyzer valves, for a total of 17 valves.**

**Model 700 controllers support up to Analytical Valves (AV-1 to AV-5 and S-1 to S-8 Stream valves**

1. Use the *Application* > *Valves* menu to access this function.
2. The Valves dialog appears, per GC type.


Valves
# Name Switch Usage Current Value
1 S/BF_1 Auto Anlyzr01 OFF
2 Dual Column Auto Anlyzr02 OFF
3 S/BF_2 Auto Anlyzr03 OFF
4 Spare Auto Unused OFF
5 Spare Auto Unused OFF
6 Stream1 Auto Stream01 OFF
7 Stream2 Auto Stream02 OFF
8 Stream3 Auto Stream03 OFF
9 Stream4 Auto Stream04 OFF
10 Stream5 Auto Stream05 OFF
OK
Cancel
Alphanumeric field (For Help, press F1)

**Valves dialog for Model 700 GC**




**Valves dialog for 2350A GCs**

To edit the settings displayed, double-click the appropriate cell or click and use the provided pull-down menus.

See the following table for details.

*Table 5-12 Description of Valve Settings*

| Setting | Description |
|---|---|
| Channel | channel number assigned |
| Label | name used to identify the valve (12 characters maximum)<br><br>**NOTICE**<br><br>**By default, the 2350A GC stream valves are shown first and are labeled S1 - S12 followed by the analytical valves (AV1 - AV5). Model 700 GCs analytical valves are shown first and are labeled AV1 - AV5 followed by the stream valves (S1 - S8).** |
| Switch | sets operational mode for this valve<br><br>Auto = valve operation is determined by the GC application<br>Off = valve is set to OFF<br>On = valve is set to ON |
| Usage (Model 700 and Model 500 GCs with 2350A Controllers) | sets which digital output from the Timed Events function (see Section 5.3) is assigned to this valve<br><br>Each Usage option is created per the following example:<br>1-AV1 - where the digit "1" is taken from the valve number set by the Valve/DO# option (see Timed Events, see Section 5.3), and the name "AV1" is taken from Label set in this Valve dialog.<br><br>**NOTICE**<br><br>**The same Usage assignment cannot be used for multiple valves, unless these valves are set to "Unused".** |
| Current Value | current state of the valve |

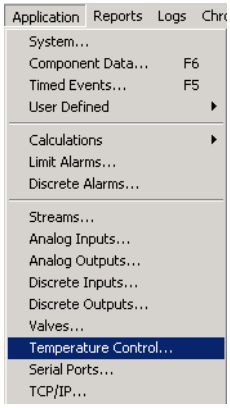
3. Click the OK button to accept your changes and return to the main window.

   Click the Cancel button to abort and return to the main window.

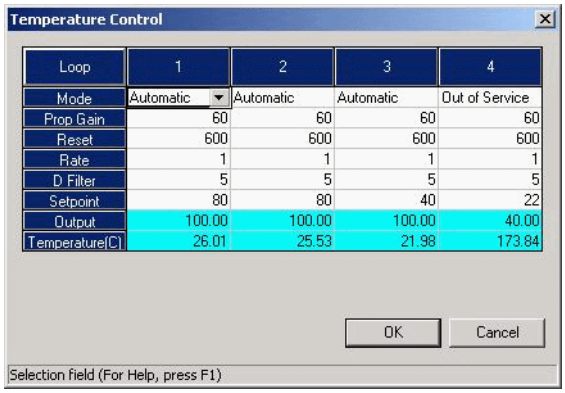
## 5.14 TEMPERATURE CONTROL

Use the Temperature Control function for monitoring the Temperature of the Oven (Detector/s and Columns) and the Stream Switching block to determine when the Model 700 is thermally stable. The bottom row labeled Temperature (C) displays the current temperatures.

The settings and values are shown in the following figure and table. The settings and values are preset at the factory and are based on the specific customer application. These values should not be changed unless recommended by Daniel Customer Service Personnel, or it is a factory application requirement.



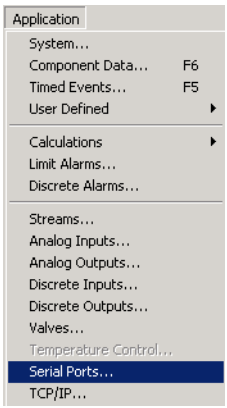

1. Use the *Application>Temperature Control* menu to access this function.
2. The Temperature Control dialog displays.



3. Use the pull down menu to select the appropriate mode setting (e.g. AUTOMATIC, MANUAL, or OUT OF SERVICE). Ensure that the temperature is constant for the Oven (i.e. Multivalve System block and column module kit) and the SSS.

| Column | Function | Factory Default Setting |
|---|---|---|
| Column 1 | Detector/s or Block Temperature | 80° C (176.0° F) |
| Column 2 | Column Temperature | 80° C (176.0° F) |
| Column 3 | Sample Stream Block Temperature | 40° C (104.0° F) |
| Column 4 | (Spare) | Future Use |

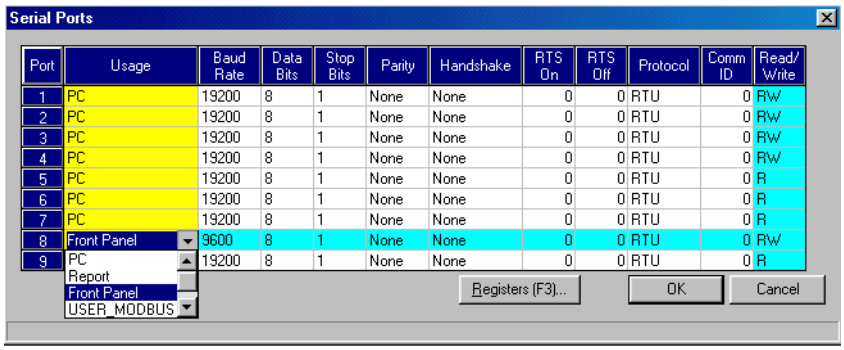
4. Click the **OK** button to apply the changes or click the **Cancel** button to discard your changes and return to the MON2000 Main window.




## 5.15 SERIAL PORTS

Use this function to configure and manipulate the serial port communication parameters the GC Controller uses to connect with MON2000.

1. Use the *Application* > *Serial Ports* menu to access this function.
2. The Serial Ports dialog appears.


Serial Ports
Port
Usage
Baud Rate
Data Bits
Stop Bits
Parity
Handshake
RTS On
RTS Off
Protocol
Comm ID
Read/ Write
1 PC 19200 8 1 None None 0 0 RTU 0 RW
2 PC 19200 8 1 None None 0 0 RTU 0 RW
3 PC 19200 8 1 None None 0 0 RTU 0 RW
4 PC 19200 8 1 None None 0 0 RTU 0 RW
5 PC 19200 8 1 None None 0 0 RTU 0 R
6 PC 19200 8 1 None None 0 0 RTU 0 R
7 PC 19200 8 1 None None 0 0 RTU 0 R
8 Front Panel 9600 8 1 None None 0 0 RTU 0 RW
9 PC 19200 8 1 None None 0 0 RTU 0 R
PC
Report
Front Panel
USER_MODBUS
Registers (F3)...
OK
Cancel

To edit the settings displayed, double-click the appropriate cell or click and use the provided pull-down menus.

**NOTICE**

**For correct communications, these parameters which are downloaded to the GC Controller, must be identical to the parameters set in the MON2000 *File* > *GC Directory* (see Section 2.9.2).**

See the following table and individual sections for details.

*Table 5-13 Description of Serial Port Settings*

| Setting | Description |
|---|---|
| Port | serial port number for GC Controller<br><br>The Model 700 and Model 500 with 2350A<br>Controller (with the PC/104 COM 4A board installed) the controller supports 8 ports<br>(9 ports with the modem).<br><br>With the Multifunction board installed, COM3 is the assigned port. |
| Usage | defines port usage – such as a slave config-uration (i.e.,User_Modbus, SIM_2251), PC<br>communication port, a Report, Front Panel, or Serial Port – as well as the general type of serial communications protocol<br><br>To accommodate installations that use Modbus registers and the SIM_2251 protocol along with a data acquisition system, MON2000 enables you to arrange data values for a more effective polling.<br><br>Note that the contents of all SIM_2251 Modbus registers are predefined, and the values for component variables are predetermined. However, a cross-index to these predefined assignments can be developed.<br><br>With the Multifunction board installed, COM3 is the assigned port. |
| Baud Rate | baud rate setting<br><br>Range: 1200, 2400, 4800, 9600, 19200, 38400<br><br>For high performing PCs, set the baud rate to 19200. If you experience a communications failure at this rate, set the baud rate to 9600. Baud rate settings less than 9600 may result in real-time delivery that is unacceptably slow. |
| Data Bits | number of data bits<br><br>Range: 7, 8<br>Default: 8 |
| Stop Bits | number of stop bits<br><br>Range: 1, 2<br>Default: 1 |

*Table 5-13 Description of Serial Port Settings (Continued)*

| Setting | Description |
|---|---|
| Parity | parity check method<br><br>Range: None, Even, Odd<br>Default: None |
| Handshake | handshaking method<br><br>Range: None, RTS-CTS, XON-XOFF<br>Default: None |
| RTS On | delay in milliseconds between RTS activation and the start of data transmission<br><br>**Note: If used, it may be necessary to set an extra delay in the GC Directory, accessed via the File>GC Directory menu.**<br><br>Range: 0 to 5000 |
| RTS Off | delay in milliseconds between RTS termination and the end of data transmission<br><br>Range: 0 to 5000 |
| Protocol | transmission protocol<br><br>Range: ASCII, RTU<br>Default: ASCII |
| Com ID | Modbus slave address<br><br>To use the address defined by the GC Controller DIP switches, set to 0. |
| RW | read/write setting<br><br>R = read only<br>W = write only<br>RW = read and write<br><br>This parameter only functions with slave ports. |

Click the OK button to accept your changes and return to the main window.

Click the Cancel button to abort and return to the main window.

### 5.15.1 Serial Ports Configuration

Each GC Controller port number is listed in the Port column of the Serial Ports dialog. The number of available ports is hardware-specific.

These ports can be configured with the Usage settings to accommodate any one of the following end-connection devices:

**NOTICE**

**The optional internal modem installed on a Model 700 or Model 500 uses COM9 only.**

**NOTICE**

**With a keyboard and display, the optional internal modem installed on a Model 700 or Model 500 uses COM8 only.**

**NOTICE**

**For proper communications, these parameters, which are continuously downloaded to the GC, must be identical to the parameters set in the MON2000 GC Directory.**

- PC – direct serial line connection to the PC, a serial line connection to an external or internal modem or an ethernet connection
- Report – direct serial line connection to a printer
- User_Modbus or SIM_2251 – connection to a Data Collection System (DCS) or a multi-drop serial data highway network

Specific configurations of these ports may also include settings for serial interface protocols (i.e., RS-232, RS-485, or RS-422).

These protocols are accomplished through jumper settings (see the GC hardware manuals for instructions, drawings, and other descriptions).

**NOTICE**

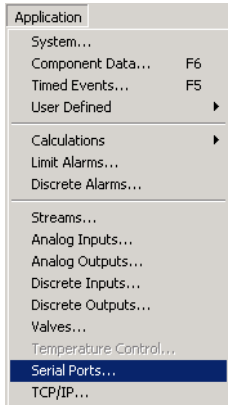
**Communications between the GC and a DCS or multi-drop serial data highway can be established with Modbus protocol. For this, the Usage setting should be either User_Modbus or SIM_2251.**

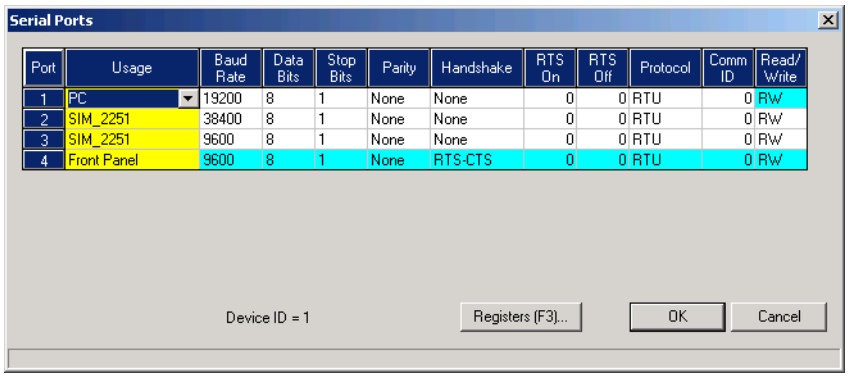
**In any Modbus host-slave configuration, there must be one Host to which any one of the GCs can respond as a Slave. Thus, the controller could be connected to a maximum of 4 different serial data networks.**

The serial interface protocol RS-232 will service most end-connection devices (i.e., PC and Report). DCS connections use either RS-485 or RS-422 protocols although, in some cases, the RS-232 protocol can be used.

To access this function,

1. From the *Application>Serial Ports* menu, select the Usage column and use the pull-down menu to select the appropriate configuration.




## 5.16 GC SERIAL PORT AND CABLE CONFIGURATIONS

This section provides more detailed information about the serial port connections of the 2350A GC Controller. It identifies serial port pin assignments and diagrams for designing RS-232 serial cables necessary for your application.

GC serial ports are found on the GC Controller Terminal Board for field wiring, and the connection points for external devices are as follows:

*Table 5-14 Serial Ports on GC Terminal Board*

| Port | DB-9 Plug | Phoenix Plug |
|---|---|---|
| 1 (COM1) | P2 | J5 |
| 2 (COM2) | P3 | J6 |
| 3 (COM3) | n/a | J10 |
| 4 (COM4) | n/a | J11 |

External modem connections can be made to any of the four serial ports. However, a possible exception exists for Serial Port 4: the internal modem for the Model 500 with the 2350A Controller, if installed, uses Serial Port 4.

Phoenix plug (bare-wire) connections are available to all four serial ports. Pin-outs are identical for all four serial port Phoenix plugs and jacks. Each Phoenix plug / jack (male) combination allows bare-wire connection and uses 9 pins as illustrated:

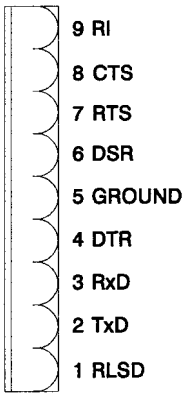


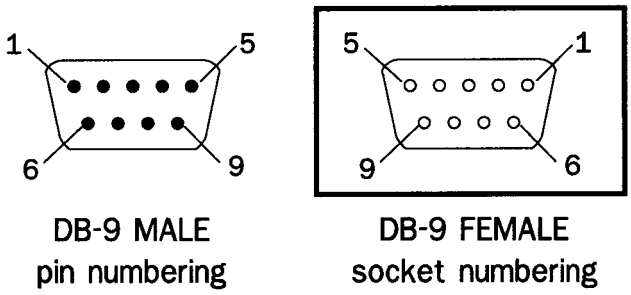

*Figure 5-1 Phoenix Connector Pinout for J5, J6, J10, J11*

DB-9 plug connections available for serial ports 1 and 2 only. Two of the serial ports, as noted in Table 5-14, permit connection to an external modem via a DB-9 plug.

Both of the GC Controller DB-9 jacks are female and have identical pin assignments.

**NOTICE**

**A DB-9 male pin numbering scheme is also illustrated, but for reference purposes only.**




pinout for both DB-9 female jacks at GC Controller

| | | | | |
|---|---|---|---|---|
| 5 GND | 4 DSR | 3 RxD | 2 TxD | 1 RLSD |
| 9 RI | 8 RTS | 7 CTS | 6 DTR | |

*Figure 5-2 DB-9 Connector and Pinout, P2 and P3*

### 5.16.1 GC DB-9 Serial to Ext. Modem DB-25

To make an RS-232 serial connection between one of the DB-9 serial ports of the GC, and an external modem with DB-25 serial port, you will need to manufacture a cable. The cable will need DB-9, male, and DB-25, male, plug cable ends as illustrated in Figure 5-3.

**NOTICE**

**GC serial ports were wired to appear as DCE so that a straight-through serial cable could be used, instead of a null-modem cable, for direct serial connection between the GC Controller and the PC, which is Data Terminal Equipment (DTE).**

The DB-9 jack on the GC serial port is wired to appear like a Data Communications Equipment (DCE). Therefore, you use a custom “null-modem” type cable, as shown below, to make the connection between the GC and an external modem.

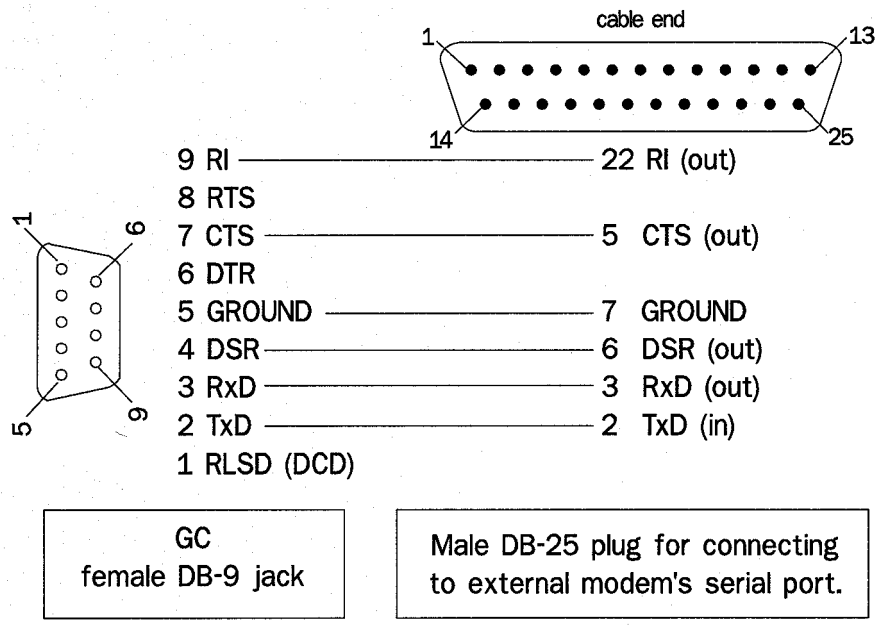



*Figure 5-3 GC DB-9 Port to External Modem DB-25 Port*

### 5.16.2 GC Phoenix Plug to Ext. Modem DB-25

To make an RS-232 serial connection between one of the Phoenix Plug serial ports of the GC, and an external modem with DB-25 serial port, you will need to manufacture the cable and its DB-25, male plug cable end as illustrated in Figure 5-4.

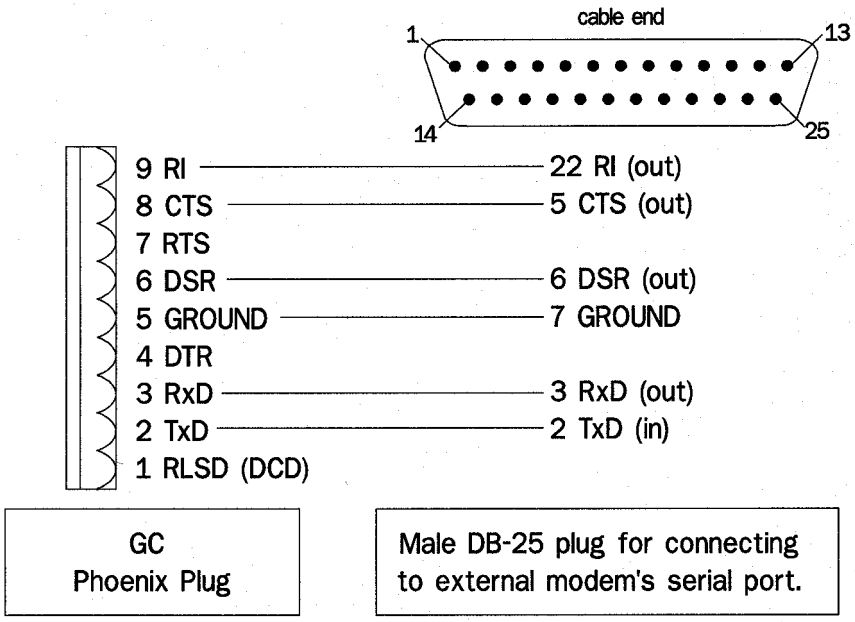



*Figure 5-4 Phoenix Plug Port to External Modem DB-25 Port*

### 5.16.3 Com ID

The GC Controller Com ID is usually preset at the factory and defined by the DIP switch settings on the controller system interface board. Five switches are reserved for defining the Com ID; therefore, Com ID values range from 1 to 31.

Normally it is not necessary to change the Com ID value to anything other than 0. Setting the Com ID to zero allows the MON2000 software to automatically recognize the Com ID defined by the controller DIP switches. When connected, MON2000 displays the controller DIP setting as the Com ID in the main window titlebar. See Table 5-15 for more information.

*Table 5-15 Description of Com ID Settings*

| Connection | Usage | Read/Write | Protocol |
|---|---|---|---|
| PC or modem<br>(direct serial connection) | PC<br>User_Modbus<br>SIM_2251 | R<br>RW | ASCII<br>RTU |
| DCS | User_Modbus<br>SIM_2251 | R<br>RW | ASCII<br>RTU |
| Printer<br>(direct serial connection) | Report | W | ASCII |

1. User_Modbus and SIM_2251 are slave port protocols (the GC Controller can operate only as a slave).
2. User_Modbus, a PLC emulation Modbus protocol, can use scaling to convert floating point numbers to integers.
3. SIM_2251 emulates Daniel 2500 communication protocol and is a simulation of the 2251 GC Controller.
4. See Appendix I for instructions on how to connect a modem to the GC Controller.

### 5.16.4 Registers

To accommodate installations that use Modbus registers and the User_Modbus protocol, MON2000 enables you to assign GC analysis variables to registers.

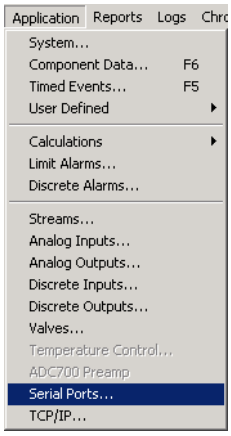
**CAUTION**

**This function is not required for normal GC operation. Only use this function if you are designing a special installation to directly access the GC Controller Modbus registers.**

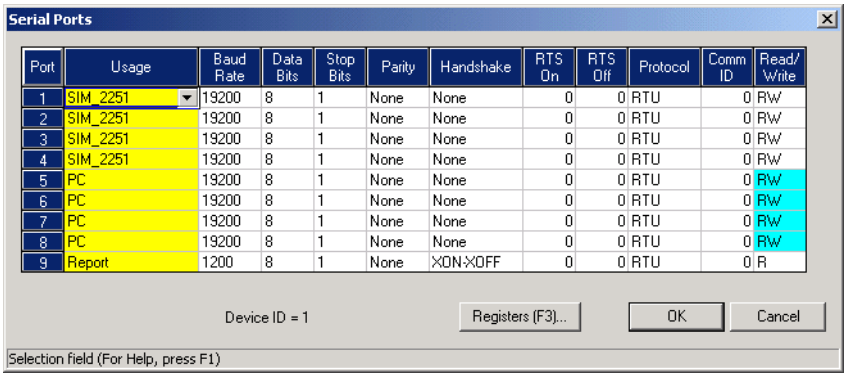
See Appendix F for more information regarding GC Modbus registers.

For a list of variable assignments made to all registers, print the communication section of the PC Config Report.

To assign GC analysis variables and scale ranges,

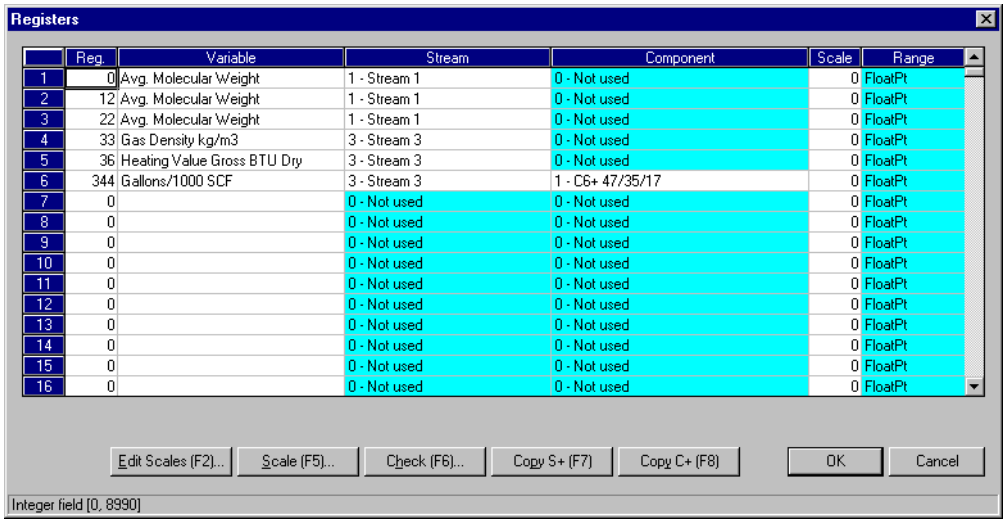



1. Use the *Application>Serial Ports* menu to access this function.
2. The Serial Ports dialog displays.


Serial Ports
Port
Usage
Baud Rate
Data Bits
Stop Bits
Parity
Handshake
RTS On
RTS Off
Protocol
Comm ID
Read/ Write
1 SIM_2251 19200 8 1 None None 0 0 RTU 0 RW
2 SIM_2251 19200 8 1 None None 0 0 RTU 0 RW
3 SIM_2251 19200 8 1 None None 0 0 RTU 0 RW
4 SIM_2251 19200 8 1 None None 0 0 RTU 0 RW
5 PC 19200 8 1 None None 0 0 RTU 0 RW
6 PC 19200 8 1 None None 0 0 RTU 0 RW
7 PC 19200 8 1 None None 0 0 RTU 0 RW
8 PC 19200 8 1 None None 0 0 RTU 0 RW
9 Report 1200 8 1 None XON-XOFF 0 0 RTU 0 R
Device ID = 1
Registers (F3)...
OK
Cancel
Selection field (For Help, press F1)

3. From the Serial Ports dialog, click the Registers (F3)... button or press the F3 key.

4. The Registers dialog appears.

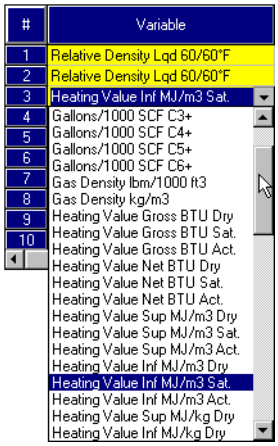

Registers
Reg.
Variable
Stream
Component
Scale
Range
1 0 Avg. Molecular Weight 1 - Stream 1 0 - Not used 0 FloatPt
2 12 Avg. Molecular Weight 1 - Stream 1 0 - Not used 0 FloatPt
3 22 Avg. Molecular Weight 1 - Stream 1 0 - Not used 0 FloatPt
4 33 Gas Density kg/m3 3 - Stream 3 0 - Not used 0 FloatPt
5 36 Heating Value Gross BTU Dry 3 - Stream 3 0 - Not used 0 FloatPt
6 344 Gallons/1000 SCF 3 - Stream 3 1 - C6+ 47/35/17 0 FloatPt
7 0 0 - Not used 0 - Not used 0 FloatPt
8 0 0 - Not used 0 - Not used 0 FloatPt
9 0 0 - Not used 0 - Not used 0 FloatPt
10 0 0 - Not used 0 - Not used 0 FloatPt
11 0 0 - Not used 0 - Not used 0 FloatPt
12 0 0 - Not used 0 - Not used 0 FloatPt
13 0 0 - Not used 0 - Not used 0 FloatPt
14 0 0 - Not used 0 - Not used 0 FloatPt
15 0 0 - Not used 0 - Not used 0 FloatPt
16 0 0 - Not used 0 - Not used 0 FloatPt
Edit Scales (F2)...
Scale (F5)...
Check (F6)...
Copy S+ (F7)
Copy C+ (F8)
OK
Cancel
Integer field [0, 8990]

5. View or edit data. Double-click a given table cell or use one of the edit function buttons, described below, to make your changes.

**NOTICE**

**For each default 0 FloatPt scale assigned, reserve 2 Modbus registers for a given variable.**

**Scale assignments other than 0 FloatPT require only one register per variable.**


#
Variable
1 Relative Density Lqd 60/60°F
2 Relative Density Lqd 60/60°F
3 Heating Value Inf MJ/m3 Sat.
4 Gallons/1000 SCF C3+
5 Gallons/1000 SCF C4+
6 Gallons/1000 SCF C5+
7 Gallons/1000 SCF C6+
8 Gas Density lbm/1000 ft3
9 Gas Density kg/m3
10 Heating Value Gross BTU Dry
Heating Value Gross BTU Sat.
Heating Value Gross BTU Act.
Heating Value Net BTU Dry
Heating Value Net BTU Sat.
Heating Value Net BTU Act.
Heating Value Sup MJ/m3 Dry
Heating Value Sup MJ/m3 Sat.
Heating Value Sup MJ/m3 Act.
Heating Value Inf MJ/m3 Dry
Heating Value Inf MJ/m3 Sat.
Heating Value Inf MJ/m3 Act.
Heating Value Sup MJ/kg Dry
Heating Value Inf MJ/kg Dry

Note that the Reg column displays the number for the GC Controller Modbus register that will be polled by a connected data acquisition system.

6. To change a variable assignment, click the appropriate Variable cell. Use the provided pull-down menu and click the desired variable to select it.

   From the Variables menu, you can assign the results of optional base pressure(s) to the Modbus register. See Section 5.16.5.

7. To change the stream assignment, click the appropriate cell. Use the provided pull-down menu and click the desired stream to select it.

   To copy the stream settings from a highlighted row and apply them to the next row, click the Copy S+ (F7) button or press the F7 key. This feature also increments the Stream value to the next available stream (e.g., incrementing from Stream 2 to Stream 8), per the GC application. An error message displays when the last available stream is reached.

8. To change the component assignment, click the appropriate cell. Use the provided pull-down menu and click the desired option to select it.

   To copy the component settings from a highlighted row and apply them to the next row, click the Copy C+ (F8) button or press the F8 key.

   This feature also increments the Component value to the next available component (e.g., incrementing from Ammonia to Benzene), per the GC application. An error message displays when the last available component is reached.

9. To select a scale and range,

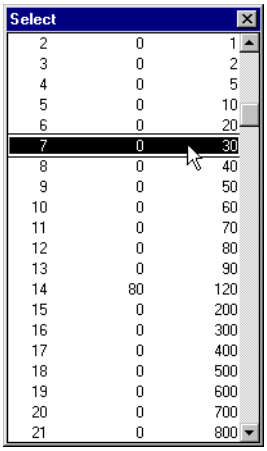
   (a) Select the scale/range to be replaced.

   By assigning a scale range, a floating point value can be converted to an integer value per the user-defined scale assignment.

**NOTICE**

**Assigning a scale and corresponding range is an optional step.**

**The default scale assignment is 0 FloatPt, which means the value is not converted to integer and is stored in two (2) adjacent Modbus registers.**




(b) Click the Scale (F5)... button or press the F5 key. A menu list of all available scales and ranges appears.

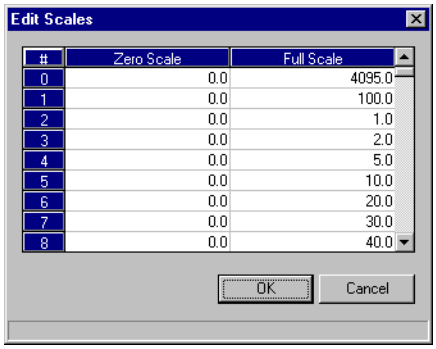
(c) Double-click the desired new scale and corresponding range.

Note that any of the available 33 scales can be redefined via the Edit Scales function (see Step 10).

10. To redefine a scale or create a custom scale,

(a) Click the Edit Scales (F2)... button or press the F2 key.

(b) The Edit Scales dialog appears.




All 33 scaling options will display.

(c) Input the new Zero Scale or Full Scale values as appropriate.

**NOTICE**

**To convert floating point data to a whole integer, each scale definition follows this algorithm:**

$$integer = \left(\frac{R_F - R_Z}{S_F - S_Z}\right) D_{fp = 3977}$$

**where**

**$R_F$ = range, Full Scale = 4095**
**$R_z$ = range, Zero Scale = 0**
**$S_F$ = scale, Full = 100**
**$S_z$ = scale, Zero = 0**
**$D_{fp}$ = data, floating pt = 97.13**
**(% from Methane)**

(d) Click the OK button to accept your changes and return to the Registers dialog.

Click the Cancel button to abort and return to the Registers dialog.

11. To check for conflicting Modbus register assignments,

    (a) Click the OK button or press the F6 key.

    (b) MON2000 displays the first encountered error.

    For this example, you would change the register number for Row 2. You would then verify all subsequent register numbers as well.

    (c) Click the OK button to accept your changes and return to the Serial Ports dialog. MON2000 automatically checks for conflicting Modbus register assignments.

    Click the Cancel button to abort and return to the Serial Ports dialog.

### 5.16.5 Setting Optional Base Pressures

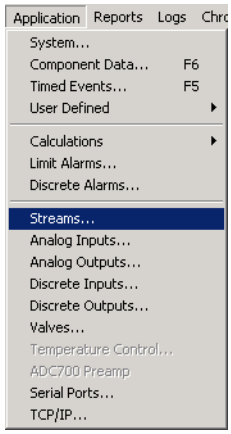
As discussed in Section 5.16.4, you can assign GC analysis variables to various Modbus registers. Follow the procedure below to add the "Optional Base Pressure" variable to the Registers List.

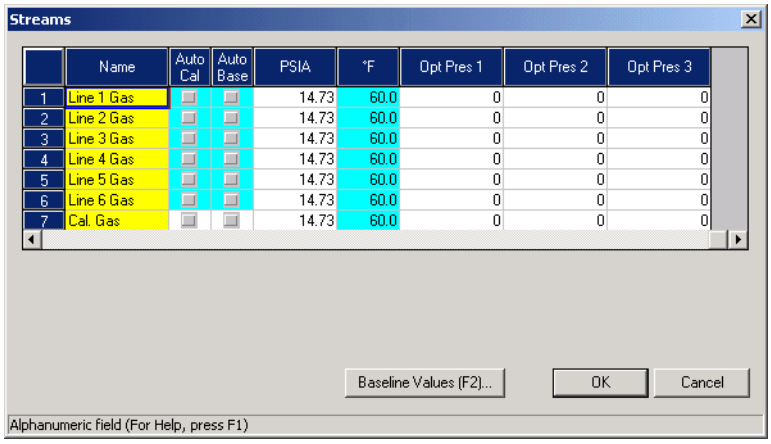
Up to three (3) optional base pressures can be used for GC analysis calculations. These optional base pressure values are entered via the Streams function (see Section 5.8).

- "Results - Opt. Base Press" – A group of 12 GC analysis calculations can be used to reflect the use of different base pressures. See Section C.3 for more information.

To assign the "Optional Base Pressure" variable,

1. Verify the values for optional base pressures that have already been entered.
   (a) Use the *Application* > *Streams* menu to access this function.
   (b) The Streams dialog box displays.



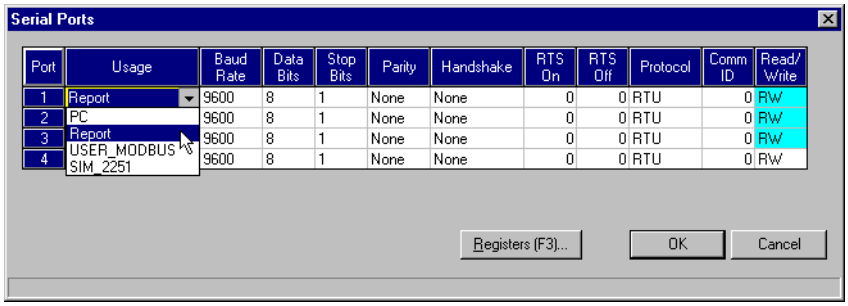


Streams
Name
Auto Cal
Auto Base
PSIA
°F
Opt Pres 1
Opt Pres 2
Opt Pres 3
1 Line 1 Gas 14.73 60.0 0 0 0
2 Line 2 Gas 14.73 60.0 0 0 0
3 Line 3 Gas 14.73 60.0 0 0 0
4 Line 4 Gas 14.73 60.0 0 0 0
5 Line 5 Gas 14.73 60.0 0 0 0
6 Line 6 Gas 14.73 60.0 0 0 0
7 Cal. Gas 14.73 60.0 0 0 0
Baseline Values (F2)...
OK
Cancel
Alphanumeric field (For Help, press F1)

(c) Scroll to the Opt Press columns and note these values along with the corresponding optional pressure and stream number(s).

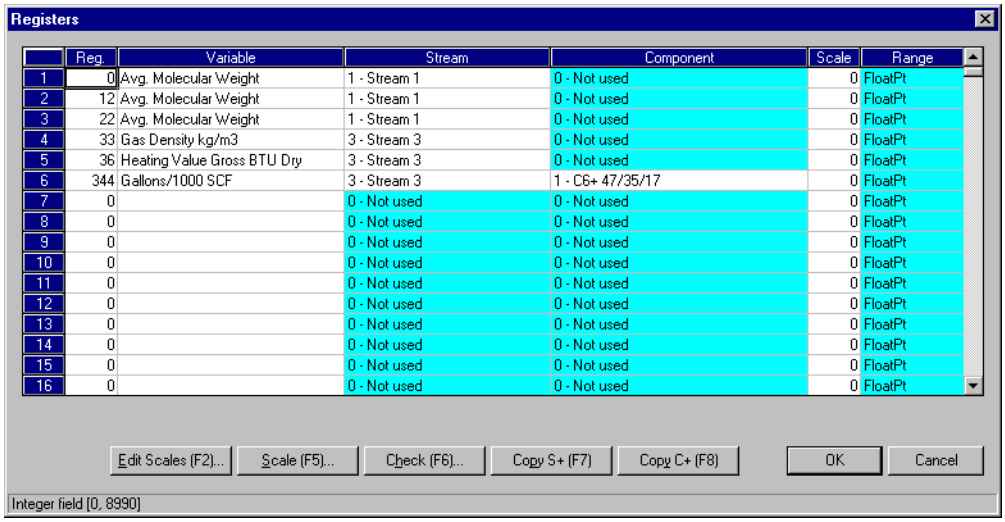
(d) If you wish to enter different pressure values, do so now and then click the OK button to accept your changes.

Otherwise, click the Cancel button to return to the main window.

2. Use the *Application* > *Serial Ports* menu to access the Register function.

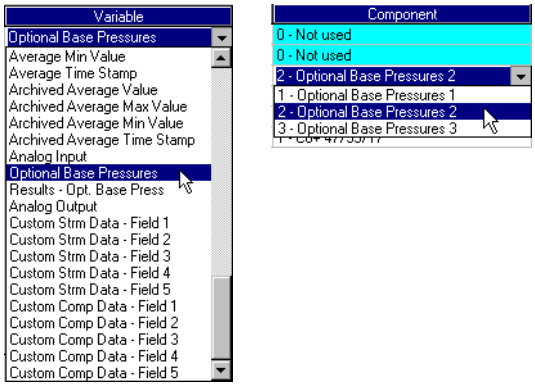


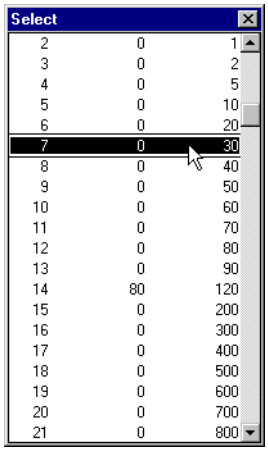
3. From the Serial Ports dialog, click the Registers (F3)... button or press the F3 key. The Registers dialog appears.


Registers
Reg.
Variable
Stream
Component
Scale
Range
1 0 Avg. Molecular Weight 1 - Stream 1 0 - Not used 0 FloatPt
2 12 Avg. Molecular Weight 1 - Stream 1 0 - Not used 0 FloatPt
3 22 Avg. Molecular Weight 1 - Stream 1 0 - Not used 0 FloatPt
4 33 Gas Density kg/m3 3 - Stream 3 0 - Not used 0 FloatPt
5 36 Heating Value Gross BTU Dry 3 - Stream 3 0 - Not used 0 FloatPt
6 344 Gallons/1000 SCF 3 - Stream 3 1 - C6+ 47/35/17 0 FloatPt
7 0 0 - Not used 0 - Not used 0 FloatPt
8 0 0 - Not used 0 - Not used 0 FloatPt
9 0 0 - Not used 0 - Not used 0 FloatPt
10 0 0 - Not used 0 - Not used 0 FloatPt
11 0 0 - Not used 0 - Not used 0 FloatPt
12 0 0 - Not used 0 - Not used 0 FloatPt
13 0 0 - Not used 0 - Not used 0 FloatPt
14 0 0 - Not used 0 - Not used 0 FloatPt
15 0 0 - Not used 0 - Not used 0 FloatPt
16 0 0 - Not used 0 - Not used 0 FloatPt
Edit Scales (F2)...
Scale (F5)...
Check (F6)...
Copy S+ (F7)
Copy C+ (F8)
OK
Cancel
Integer field [0, 8990]

4. From the Registers dialog, use the Variable pull-down menu to select the *Optional Base Pressures* option.

5. Use the corresponding component pull-down menu to select the desired optional base pressure option.


Variable
Optional Base Pressures
Average Min Value
Average Time Stamp
Archived Average Value
Archived Average Max Value
Archived Average Min Value
Archived Average Time Stamp
Analog Input
Optional Base Pressures
Results - Opt. Base Press
Analog Output
Custom Strm Data - Field 1
Custom Strm Data - Field 2
Custom Strm Data - Field 3
Custom Strm Data - Field 4
Custom Strm Data - Field 5
Custom Comp Data - Field 1
Custom Comp Data - Field 2
Custom Comp Data - Field 3
Custom Comp Data - Field 4
Custom Comp Data - Field 5
Component
0 - Not used
0 - Not used
2 - Optional Base Pressures 2
1 - Optional Base Pressures 1
2 - Optional Base Pressures 2
3 - Optional Base Pressures 3




6. To assign a scale, ensure that the correct row is selected and click the Scale (F5)... button or press the F5 key. Double-click the desired scale option to apply.

   For instructions on creating or editing a scale, see Section 5.16.4.

7. The "Optional Base Pressure" variable should be listed with the settings specified.

8. Click the OK button to accept your changes.

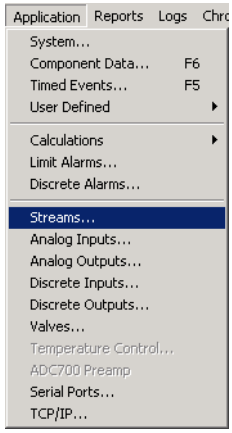
### 5.16.6 Setting Optional Base Results

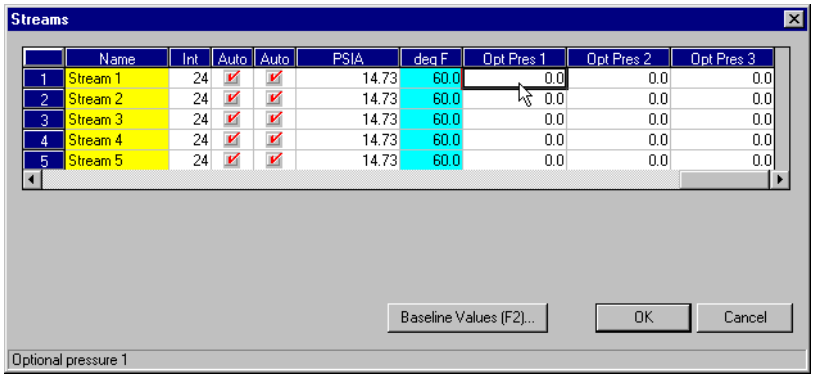
As discussed in Section 5.16.4, you can assign GC analysis variables to various Modbus registers. Follow the procedure below to add the "Results - Opt. Base Press" variable to the Registers List.

A group of 12 GC analysis calculations can be used to reflect the use of different base pressures. See Section C.3 for more information.

To assign the "Results - Opt. Base Press" variable,

1. Verify the values for optional base pressures that have already been entered.
   (a) Use the *Application* > *Streams* menu to access this function.
   (b) The Streams dialog displays.



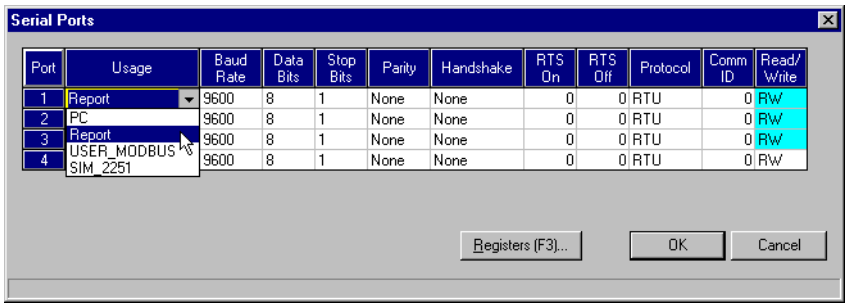


Streams
Name Int Auto Auto PSIA deg F Opt Pres 1 Opt Pres 2 Opt Pres 3
1 Stream 1 24 14.73 60.0 0.0 0.0 0.0
2 Stream 2 24 14.73 60.0 0.0 0.0 0.0
3 Stream 3 24 14.73 60.0 0.0 0.0 0.0
4 Stream 4 24 14.73 60.0 0.0 0.0 0.0
5 Stream 5 24 14.73 60.0 0.0 0.0 0.0
Baseline Values (F2)...
OK
Cancel
Optional pressure 1

   (c) Scroll to the Opt Press columns and note these values along with the corresponding optional pressure and stream number(s).

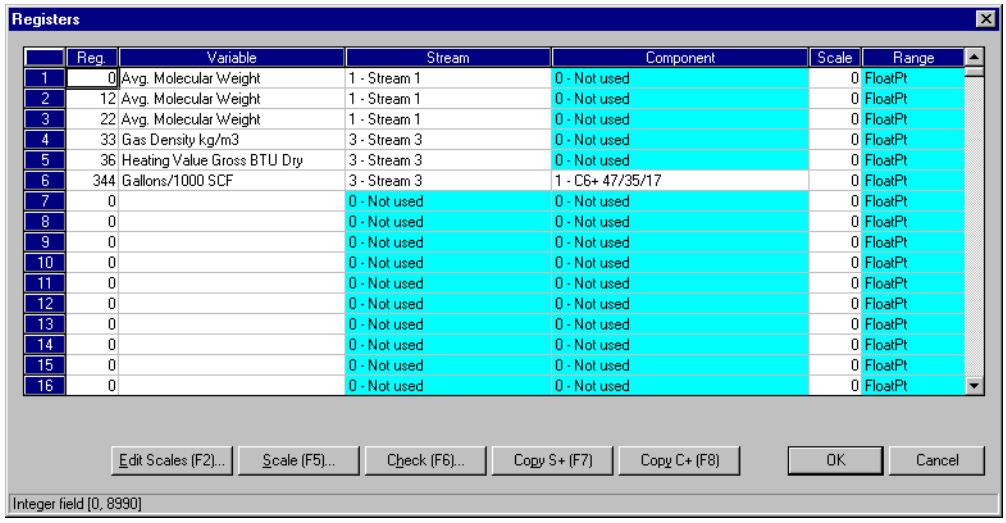
(d) If you wish to enter different pressure values, do so now and then click the OK button to accept your changes.

Otherwise, click the Cancel button to return to the main window.

2. Use the *Application* > *Serial Ports* menu to access this function.

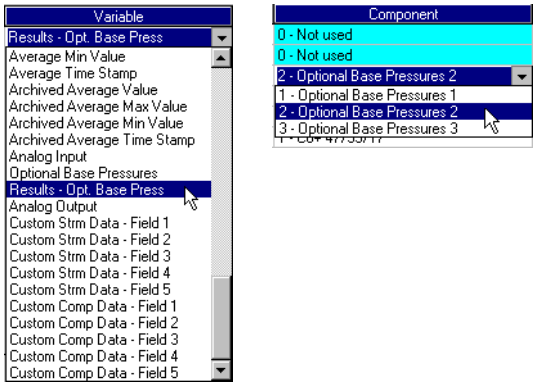



3. From the Serial Ports dialog, click the Registers (F3)... button or press the F3 key. The Registers dialog appears.


Registers
Reg.
Variable
Stream
Component
Scale
Range
1 0 Avg. Molecular Weight 1 - Stream 1 0 - Not used 0 FloatPt
2 12 Avg. Molecular Weight 1 - Stream 1 0 - Not used 0 FloatPt
3 22 Avg. Molecular Weight 1 - Stream 1 0 - Not used 0 FloatPt
4 33 Gas Density kg/m3 3 - Stream 3 0 - Not used 0 FloatPt
5 36 Heating Value Gross BTU Dry 3 - Stream 3 0 - Not used 0 FloatPt
6 344 Gallons/1000 SCF 3 - Stream 3 1 - C6+ 47/35/17 0 FloatPt
7 0 0 - Not used 0 - Not used 0 FloatPt
8 0 0 - Not used 0 - Not used 0 FloatPt
9 0 0 - Not used 0 - Not used 0 FloatPt
10 0 0 - Not used 0 - Not used 0 FloatPt
11 0 0 - Not used 0 - Not used 0 FloatPt
12 0 0 - Not used 0 - Not used 0 FloatPt
13 0 0 - Not used 0 - Not used 0 FloatPt
14 0 0 - Not used 0 - Not used 0 FloatPt
15 0 0 - Not used 0 - Not used 0 FloatPt
16 0 0 - Not used 0 - Not used 0 FloatPt
Edit Scales (F2)...
Scale (F5)...
Check (F6)...
Copy S+ (F7)
Copy C+ (F8)
OK
Cancel
Integer field [0, 8990]

4. From the Registers dialog, use the Variable pull-down menu to select the *Results - Opt. Base Press* option.

5. Use the corresponding component pull-down menu to select the desired optional base pressure option.


Variable
Results - Opt. Base Press
Average Min Value
Average Time Stamp
Archived Average Value
Archived Average Max Value
Archived Average Min Value
Archived Average Time Stamp
Analog Input
Optional Base Pressures
Results - Opt. Base Press
Analog Output
Custom Strm Data - Field 1
Custom Strm Data - Field 2
Custom Strm Data - Field 3
Custom Strm Data - Field 4
Custom Strm Data - Field 5
Custom Comp Data - Field 1
Custom Comp Data - Field 2
Custom Comp Data - Field 3
Custom Comp Data - Field 4
Custom Comp Data - Field 5
Component
0 - Not used
0 - Not used
2 - Optional Base Pressures 2
1 - Optional Base Pressures 1
2 - Optional Base Pressures 2
3 - Optional Base Pressures 3

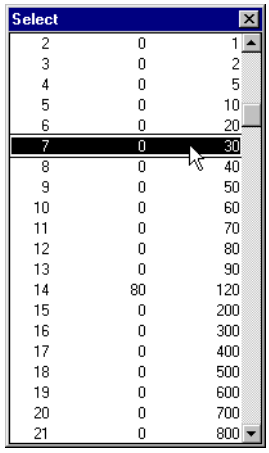
See Table 5-16 to determine which number you should enter.

**NOTICE**

**Metric GC analysis variables are available only if the Metric Base Conditions option has been enabled (see Section 5.1).**

6. To assign a scale, ensure that the correct row is selected and click the Scale (F5)... button or press the F5 key. Double-click the desired scale option to apply.

   For instructions on creating or editing a scale, see Section 5.16.4.




7. The "Results - Opt. Base Press" variable should be listed with the settings specified.

8. Click the OK button to accept your changes.

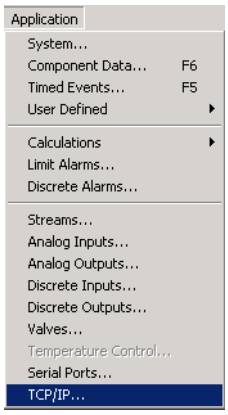
*Table 5-16 GC Analysis Variable Number per Optional Pressure*

| GC Analysis Variable | | Optional Pressure | | |
|---|---|---|---|---|
| **U.S.** | **Metric** | **1** | **2** | **3** |
| Gross Heating Value or Btu (Dry) | Heating Value, Superior, MJ/$m^3$ (Dry) | 1 | 13 | 25 |
| Gross Heating Value or Btu (Sat.) | Heating Value, Superior, MJ/$m^3$ (Sat.) | 2 | 14 | 26 |
| Gross Heating Value or Btu (Act.) | Heating Value, Superior, MJ/$m^3$ (Act.) | 3 | 15 | 27 |
| Net Btu (Dry) | Heating Value, Inferior, MJ/$m^3$ (Dry) | 4 | 16 | 28 |
| Net Btu (Sat.) | Heating Value, Inferior, MJ/$m^3$ (Sat.) | 5 | 17 | 29 |
| Net Btu (Act.) | Heating Value, Inferior, MJ/$m^3$ (Act.) | 6 | 18 | 30 |
| Real Relative Density Gas | Heating Value, Superior, kcal/$m^3$ (Dry) | 7 | 19 | 31 |
| Gallons/1000 SCF C2 + | Heating Value, Superior, kcal/$m^3$ (Sat.) | 8 | 20 | 32 |
| Gallons/1000 SCF C3 + | Heating Value, Superior, kcal/$m^3$ (Act.) | 9 | 21 | 33 |
| Gallons/1000 SCF C4 + | Heating Value, Inferior, kcal/$m^3$ (Dry) | 10 | 22 | 34 |
| Gallons/1000 SCF C5 + | Heating Value, Inferior, kcal/$m^3$ (Sat.) | 11 | 23 | 35 |
| Gallons/1000 SCF C6 + | Heating Value, Inferior, kcal/$m^3$ (Act.) | 12 | 24 | 36 |

**NOTICE**

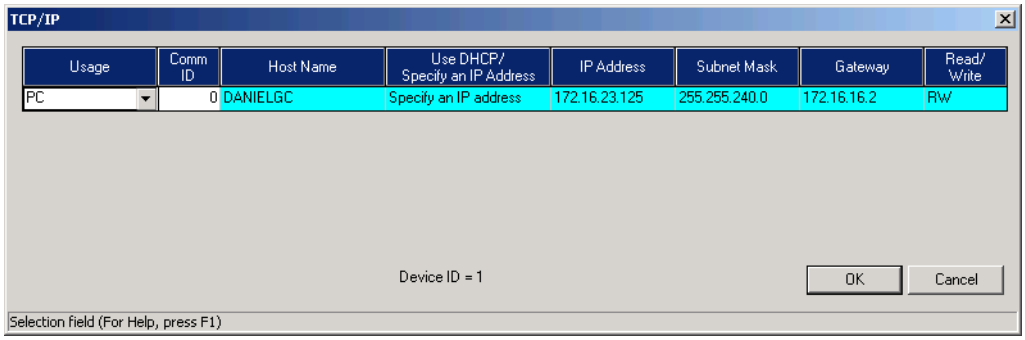
**Use the above index numbers to assign "Results - Opt. Base Press" to User_Modbus registers.**

## 5.17 TCP/IP, SUBNET, AND GATEWAY MENU




Use this function to configure the TCP/IP, Subnet, and Gateway communication parameters for the 2350A GC Controller.

1. Use the *Application* > *TCP/IP* menu to access this function.
2. The TCP/IP dialog displays. See Appendix F for detailed instructions for the Ethernet card installation, TCP/IP, Subnet, and Gateway settings.



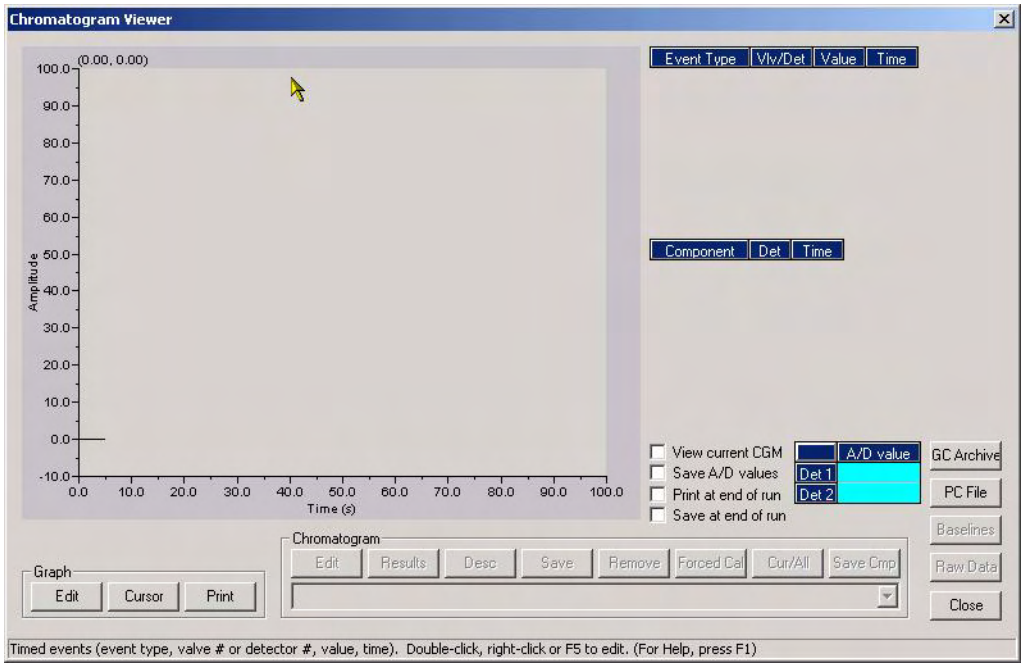
# CHROMATOGRAM VIEWER

Use the Chromatogram Viewer to display and print live, archived, or saved chromatograms (from a **.cgm** file on disk). The 2350A GC Controller saves the most recent chromatograms for each stream running in the Stream Sequence, as well as the chromatogram from the most recent calibration run for each CDT. See the following sections for further instructions.

## 6.1 CHROMATOGRAM VIEWER FUNCTION

To access the Chromatogram Viewer,

1. Connect to the GC.
2. Use the *Chromatogram* > *Chromatogram Viewer* menu to access this function.
3. The Chromatogram Viewer dialog appears.

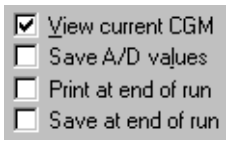


4. Click the Close button to exit this dialog. Any display changes or open data will be lost. See Section 6.4 to save a chromatogram to disk.

## 6.2 VIEWING A LIVE CHROMATOGRAM

### 6.2.1 From Online GC

To view a live chromatogram trace from the online GC,

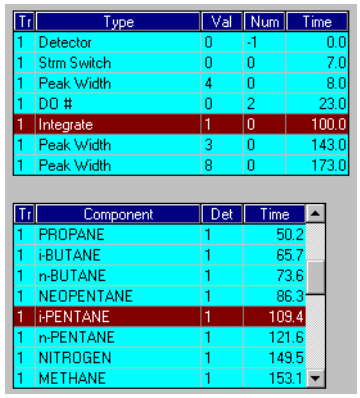



1. Check the *View current CGM* option.

   If a chromatogram contains data for more than one detector, a Select Detector menu dialog displays. Double-click either "Detector 1", "Detector 2", or "Both".

2. MON2000 plots the current, live chromatogram.

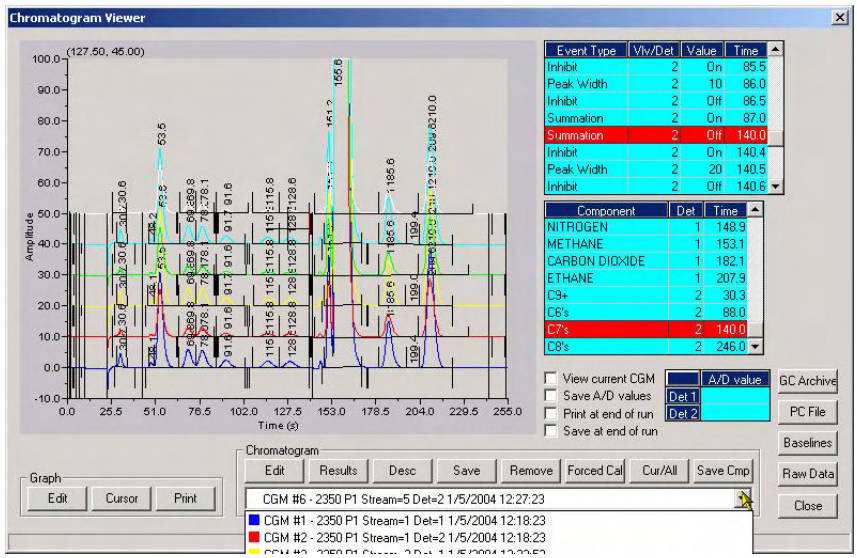
   The corresponding data is dynamically displayed in the provided legends.


Tr Type Val Num Time
1 Detector 0 -1 0.0
1 Strm Switch 0 0 7.0
1 Peak Width 4 0 8.0
1 DO # 0 2 23.0
1 Integrate 1 0 100.0
1 Peak Width 3 0 143.0
1 Peak Width 8 0 173.0
Tr Component Det Time
1 PROPANE 1 50.2
1 i-BUTANE 1 65.7
1 n-BUTANE 1 73.6
1 NEOPENTANE 1 86.3
1 i-PENTANE 1 109.4
1 n-PENTANE 1 121.6
1 NITROGEN 1 149.5
1 METHANE 1 153.1

   Use the Graph and Chromatogram functions to manipulate the display. To zoom in on a particular point, click and drag your mouse over that area; repeat as necessary. Use the Restore State or Zoom Out options from the right-click menu (see Section 6.9) to return to the original display.

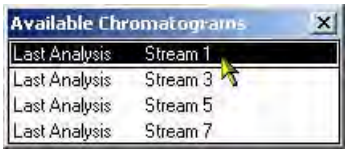
   You can display up to 8 chromatograms at one time. Each chromatogram is color-

coded; use the Chromatogram pull-down menu to select a specific chromatogram.




### 6.2.2 From GC Archive

To view the most recent chromatogram trace from the online GC archive,




1. Click the GC Archive button. The Available Chromatograms dialog appears.
2. Double-click the desired entry.

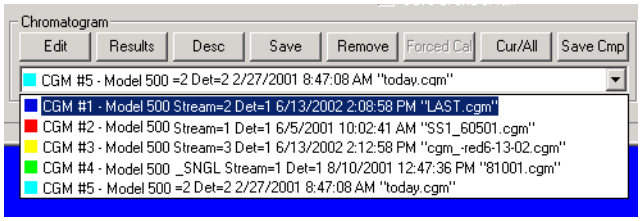
   If a chromatogram contains data for more than one detector, a Select Detector menu dialog displays. Double-click either "Detector 1", "Detector 2", or "Both".
3. MON2000 plots the archived chromatogram.

   The corresponding data is dynamically displayed in the provided legends.

   Use the Graph and Chromatogram functions to manipulate the display. To

zoom in on a particular point, click and drag your mouse over that area; repeat as necessary. Use the Restore State or Zoom Out options from the right-click menu (see Section 6.9) to return to the original display.

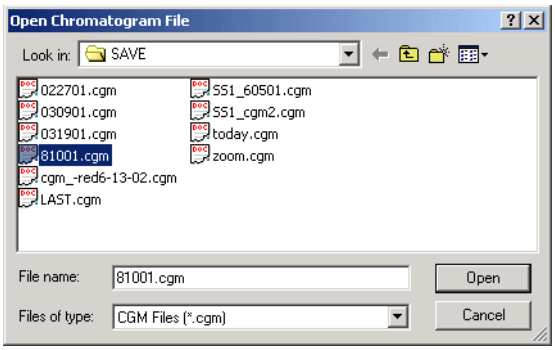
You can display up to 8 chromatograms at one time. Each chromatogram is color-coded; use the Chromatogram pull-down menu to select a specific chromatogram.


Chromatogram
Edit
Results
Desc
Save
Remove
Forced Cal
Cur/All
Save Cmp
CGM #5 - Model 500 =2 Det=2 2/27/2001 8:47:08 AM "today.cgm"
CGM #1 - Model 500 Stream=2 Det=1 6/13/2002 2:08:58 PM "LAST.cgm"
CGM #2 - Model 500 Stream=1 Det=1 6/5/2001 10:02:41 AM "SS1_60501.cgm"
CGM #3 - Model 500 Stream=3 Det=1 6/13/2002 2:12:58 PM "cgm_-red6-13-02.cgm"
CGM #4 - Model 500 _SNGL Stream=1 Det=1 8/10/2001 12:47:36 PM "81001.cgm"
CGM #5 - Model 500 =2 Det=2 2/27/2001 8:47:08 AM "today.cgm"

### 6.2.3 From File on Disk

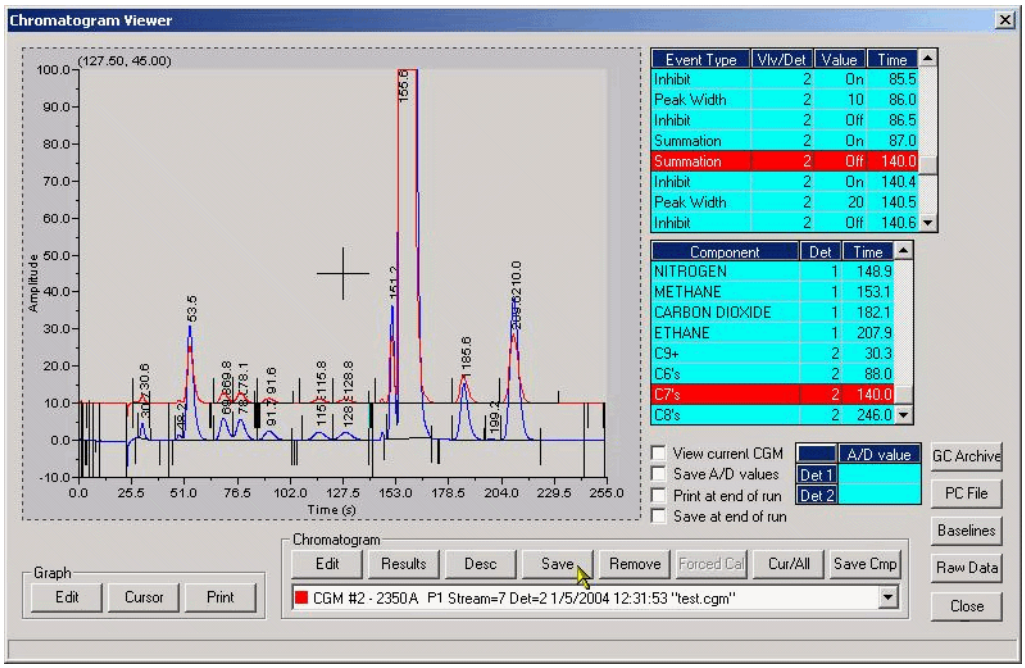
To view a chromatogram trace from a file previously saved to disk,

1. Click the PC File button. The Open Chromatogram File dialog appears.




2. Use the provided directory tree to locate the desired CGM file or CGM Comparison file and click the OK button to open.

3. The Chromatogram window displays.




If a chromatogram contains data for more than one detector, a Select Detector menu dialog displays. Double-click either "Detector 1", "Detector 2", or "Both".

4. MON2000 displays the chromatogram file.

   The corresponding data is dynamically displayed in the provided legends.

   Use the Graph and Chromatogram functions to manipulate the display. To zoom in on a particular point, click and drag your mouse over that area; repeat as necessary. Use the Save State, Restore State, or Zoom In or Out options from the right-click menu (see Section 6.9) to return to the original display for both Live and Archived CGM views. Press the keyboard HOME key to force the CMG view to the default state. Also, pressing the keyboard HOME key sets the CGM view to the default state if the current application analysis time is different from the previous application analysis time.

| Tr | Type | Val | Num | Time |
|---|---|---|---|---|
| 1 | Detector | 0 | -1 | 0.0 |
| 1 | Strm Switch | 0 | 0 | 7.0 |
| 1 | Peak Width | 4 | 0 | 8.0 |
| 1 | DO # | 0 | 2 | 23.0 |
| 1 | Integrate | 1 | 0 | 100.0 |
| 1 | Peak Width | 3 | 0 | 143.0 |
| 1 | Peak Width | 8 | 0 | 173.0 |

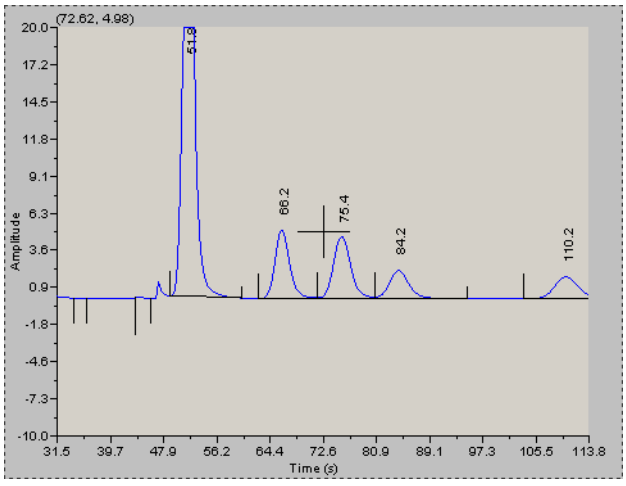
| Tr | Component | Det | Time |
|---|---|---|---|
| 1 | PROPANE | 1 | 50.2 |
| 1 | i-BUTANE | 1 | 65.7 |
| 1 | n-BUTANE | 1 | 73.6 |
| 1 | NEOPENTANE | 1 | 86.3 |
| 1 | i-PENTANE | 1 | 109.4 |
| 1 | n-PENTANE | 1 | 121.6 |
| 1 | NITROGEN | 1 | 149.5 |
| 1 | METHANE | 1 | 153.1 |

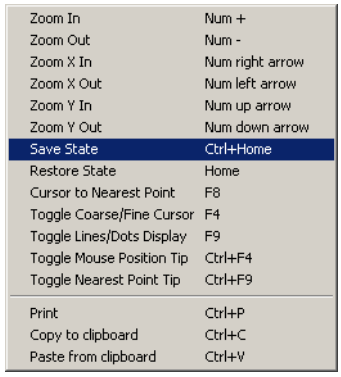
**NOTICE**

**The Save State function is available when viewing a live or archived CGM.**

**NOTICE**

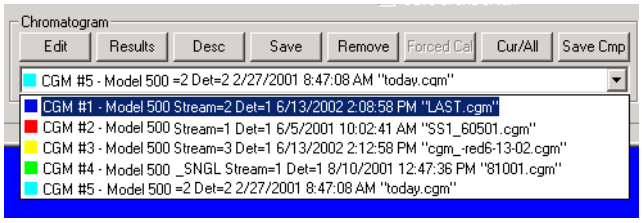
**The MON2000 software looks for and finds the application's analysis time. Pressing the "Home" key returns the user to the default CGM state.**





Zoom In Num +
Zoom Out Num -
Zoom X In Num right arrow
Zoom X Out Num left arrow
Zoom Y In Num up arrow
Zoom Y Out Num down arrow
Save State Ctrl+Home
Restore State Home
Cursor to Nearest Point F8
Toggle Coarse/Fine Cursor F4
Toggle Lines/Dots Display F9
Toggle Mouse Position Tip Ctrl+F4
Toggle Nearest Point Tip Ctrl+F9
Print Ctrl+P
Copy to clipboard Ctrl+C
Paste from clipboard Ctrl+V

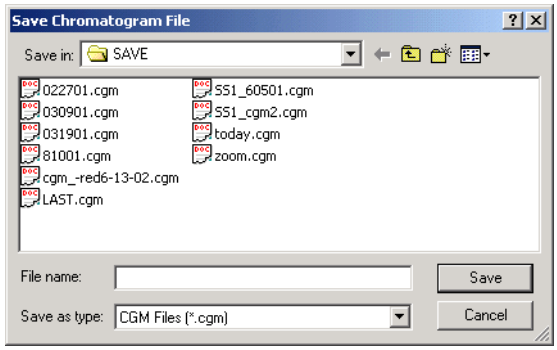
**Right Click Menu**

You can display up to 8 chromatograms at one time. Each chromatogram is color-coded; use the Chromatogram pull-down menu to select a specific chromatogram


Chromatogram
Edit
Results
Desc
Save
Remove
Forced Cal
Cur/All
Save Cmp
CGM #5 - Model 500 =2 Det=2 2/27/2001 8:47:08 AM "today.cgm"
CGM #1 - Model 500 Stream=2 Det=1 6/13/2002 2:08:58 PM "LAST.cgm"
CGM #2 - Model 500 Stream=1 Det=1 6/5/2001 10:02:41 AM "SS1_60501.cgm"
CGM #3 - Model 500 Stream=3 Det=1 6/13/2002 2:12:58 PM "cgm_-red6-13-02.cgm"
CGM #4 - Model 500 _SNGL Stream=1 Det=1 8/10/2001 12:47:36 PM "81001.cgm"
CGM #5 - Model 500 =2 Det=2 2/27/2001 8:47:08 AM "today.cgm"

5. Click the Save Cmp button to save the selected comparison file to disk.

   The Save Chromatogram Comparison File dialog appears.




6. Enter the file name to be saved and click the Save button to save the file to disk.

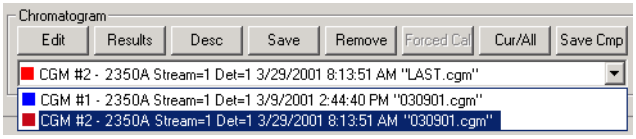
   Or,

   Click the Cancel button to exit this dialog.

## 6.3 REMOVING A CHROMATOGRAM FROM VIEW

To remove a chromatogram trace from the Viewer display (and close the cgm file, if reading from disk),

1. Use the Chromatogram pull-down menu to select a specific chromatogram.




2. Click the Remove button. MON2000 removes the chromatogram from view and, if applicable, closes the .cgm file.

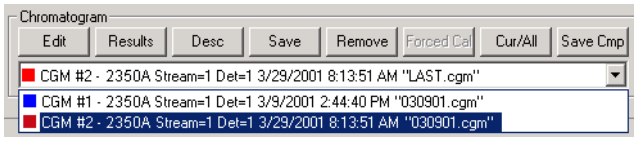
## 6.4 SAVING A CHROMATOGRAM TO DISK

**NOTICE**

**This function will save a live chromatogram at the current point, thus overwriting the "last.cgm" file.**

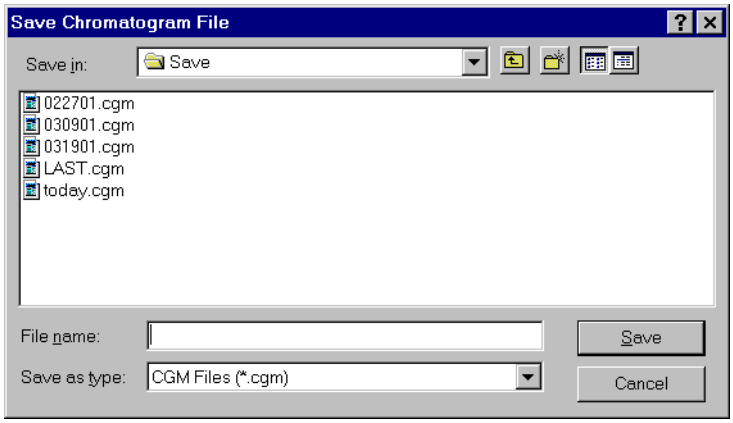
To save a currently displayed chromatogram to disk,

1. Use the Chromatogram pull-down menu to select a specific chromatogram.




2. Click the Save button.

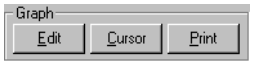
MON2000 displays the Save Chromatogram File window.




Use the provided directory tree to select the desired file location and name, then click the Save button.

3. MON2000 saves the specified chromatogram along with its corresponding graph settings.

## 6.5 GRAPH FUNCTIONS

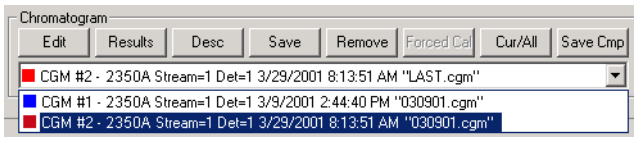



Use the Graph buttons to access any of the following graph-related functions.

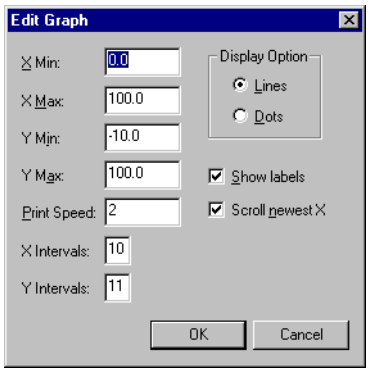
### 6.5.1 Editing the Chromatogram Graph

Use the Edit Graph function to change the span and interval for the x/y axis, as well as other display parameters.

1. Use the Chromatogram pull-down menu to select a specific chromatogram.



2. Click the Edit button. The Edit Graph dialog appears.




3. Use the provided attributes and options to change the chromatogram display and printer speed as desired.

4. Click the OK button to accept your changes and return to the Chromatogram Viewer dialog.

   Click the Cancel button to abort and return to the Chromatogram Viewer dialog.

5. The chromatogram display changes as specified.

   Additional display options are available by right-clicking the display area. See Section 6.9 for more information.

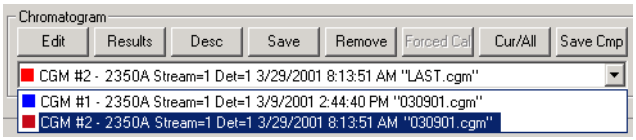
### 6.5.2 Changing Cursor Size

To toggle the cursor size from coarse movement (less accurate) to fine movement (more accurate), click the Cursor button.

### 6.5.3 Printing the Chromatogram

To print a currently displayed area of the chromatogram,

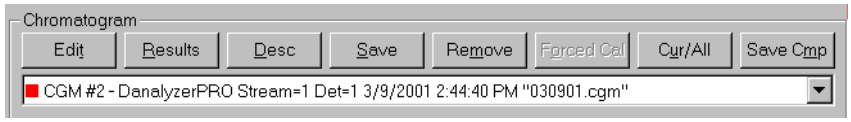
1. Use the Chromatogram pull-down menu to select a specific chromatogram.




2. Click the Print button.

## 6.6 CHROMATOGRAM FUNCTIONS

Use the Chromatogram buttons to access any of the following chromatogram-related functions.




- Edit - edit the Chromatogram
- Results - view the CGM calculation results
- Desc - save a description of the CGM
- Save - save the displayed chromatogram to disk
- Remove - removes a chromatogram from view
- Forced Cal - perform a forced calibration
- Cur/All - toggle the TEV and CGM Component spreadsheet display
- Save CMP - save multiple CGMs

**NOTICE**

**To save the displayed chromatogram to disk, see Section 6.4.**

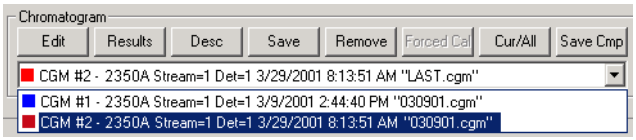
**To remove a chromatogram from view, see Section 6.3.**

**To toggle the TEV and CGM Component spreadsheet display, see Section 6.6.8.**

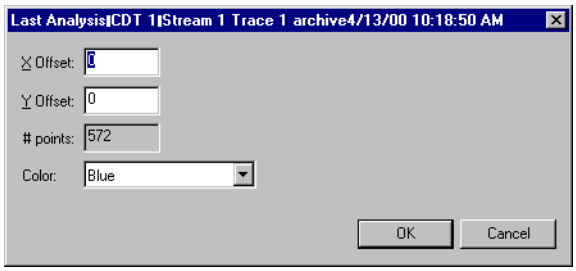
### 6.6.1 Editing the Chromatogram

Use the Edit Chromatogram function to change the x/y offset values and other display parameters such as color.

1. Use the Chromatogram pull-down menu to select a specific chromatogram.




2. Click the Edit button. The Edit Chromatogram dialog appears.




3. Use the *X Offset* and *Y Offset* values to change the chromatogram display as desired.
4. Use the *Color* pull-down menu to assign a different color to this chromatogram.
5. Click the OK button to accept your changes and return to the Chromatogram Viewer dialog.

   Click the Cancel button to abort and return to the Chromatogram Viewer dialog.

**NOTICE**

**In the edit mode, initial focus is applied to the currently selected event in the table, or to the event with the closest time.**

**NOTICE**

**If more than one CGM is displayed, only the selected CGM timed events will be available to edit.**

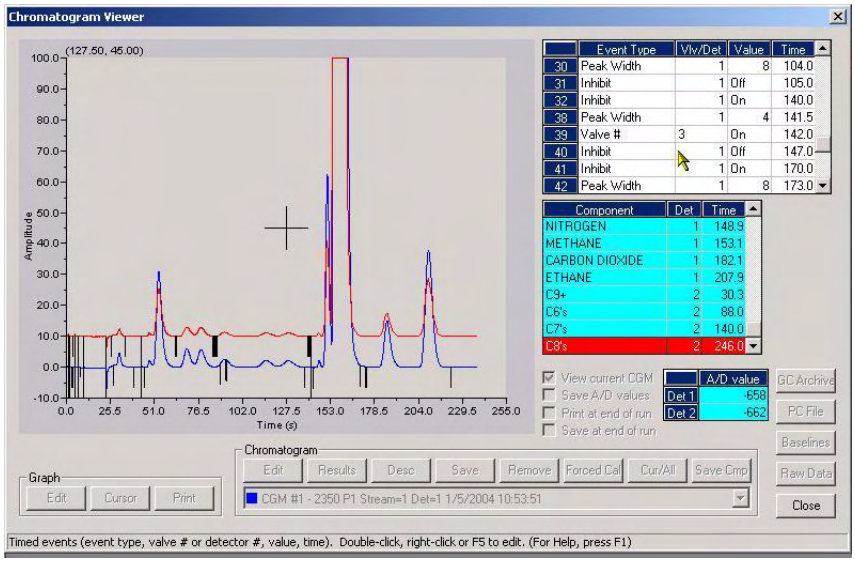
### 6.6.2 Editing TEVs from CGM Viewer

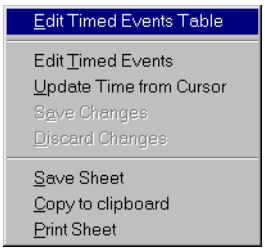
To edit the Timed Events Table (TEV) from the Chromatogram Viewer window,

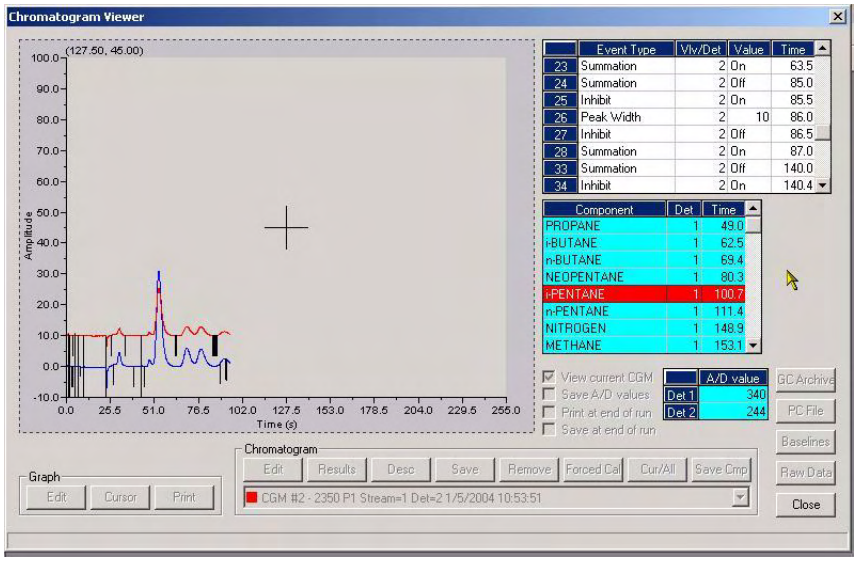
1. Double-click the left mouse button, while hovering over the TEV legend, to edit the timed events from the CGM viewer (see the following figures).

   Or,

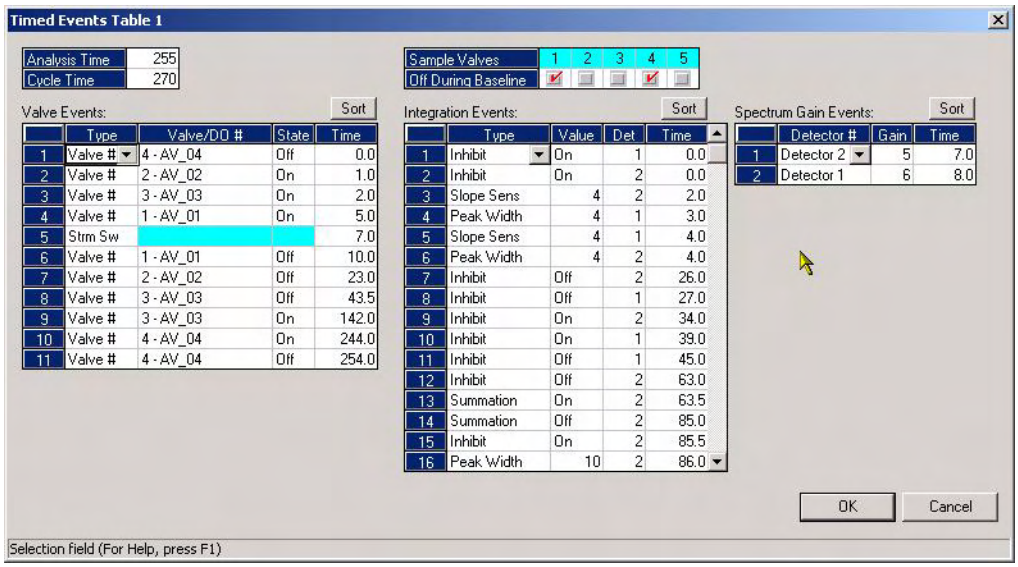
   Right-click and use the drop-down menu to modify, add, insert, and delete TEV's via the normal editing procedures.






MON2000 displays the Timed Events Table dialog.



**NOTICE**

**Save changes and discard changes options are available from the right-click menu.**

2. Click the Save button to save your changes, or press the F8 key.
3. Press the **ESC** key to discard changes.

### 6.6.3 Editing Retention Times from CGM Viewer

To edit component retention from the Chromatogram Viewer window,

**NOTICE**

**You must access the Component Data Table to add, insert, and delete retention times. Use the *Application > Component Data* menu or press the F6 key.**

1. Double-click the left mouse button to edit the retention times from the CGM viewer

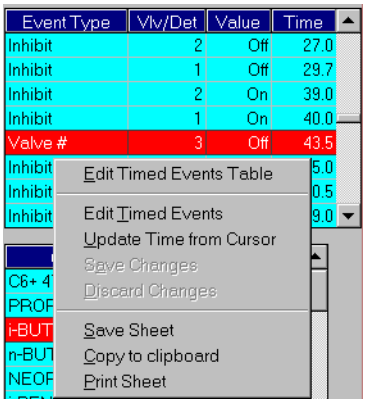
   Or,

   Right-click and use the drop-down menu to modify retention times via the normal editing procedures.

### 6.6.4 Editing TEVs from Cursor

To update Timed Events from the Chromatogram Viewer using the cursor,

1. Right-click the mouse button, with the mouse pointer hovered over the Event Time legend.




   From the pull-down menu, select Update Time from Cursor.

Or,

Press the F9 key. MON2000 displays the message, “Reading GC Data” in the status bar, then actives the TEV Table.

| | Event Type | Vlv/Det | Value | Time |
|---|---|---|---|---|
| 25 | Inhibit | 1 | Off | 29.7 |
| 26 | Inhibit | 2 | On | 39.0 |
| 27 | Inhibit | 1 | On | 40.0 |
| 28 | Valve # | 3 | Off | 43.5 |
| 29 | Inhibit | 2 | Off | 43.1 |
| 30 | Inhibit | 1 | Off | 50.5 |
| 31 | Inhibit | 2 | On | 89.0 |
| 32 | Peak Width | 2 | 8 | 92.0 |

2. Click the Save button to save your changes, or press the F8 key.

   Press the **ESC** key to discard changes.

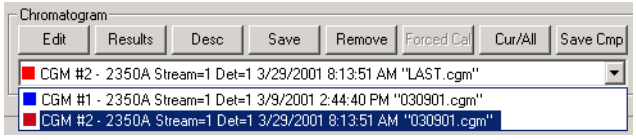
**NOTICE**

**Save changes and discard changes options are available from the right-click menu.**

### 6.6.5 Viewing the Chromatogram Results

To read a table of calculation results for a selected chromatogram,

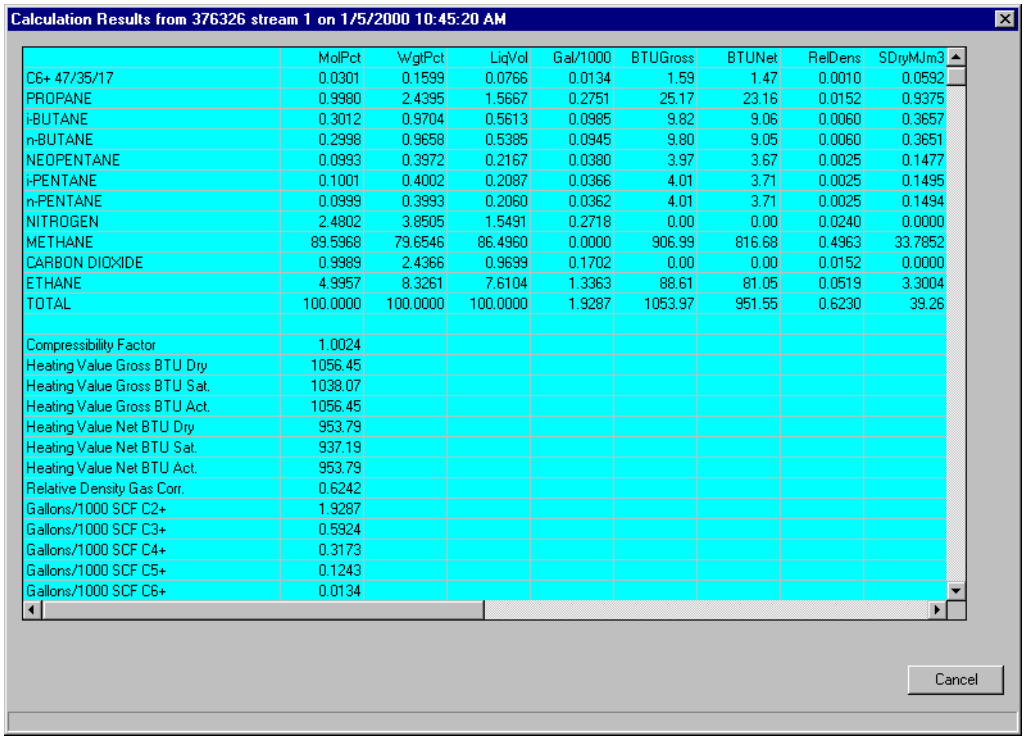
1. Use the Chromatogram pull-down menu to select a specific chromatogram.




2. Click the Results button. A dialog appears asking if the results should be displayed using the calculation control flags.

3. Click the Yes button to display the report using the calculations selected in the *Application>Control* menu.

Click the No button to display the report using ALL calculations.



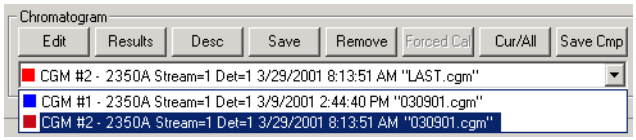

| | MolPct | WgtPct | LiqVol | Gal/1000 | BTUGross | BTUNet | RelDens | SDryMJm3 |
|---|---|---|---|---|---|---|---|---|
| C6+ 47/35/17 | 0.0301 | 0.1599 | 0.0766 | 0.0134 | 1.59 | 1.47 | 0.0010 | 0.0592 |
| PROPANE | 0.9980 | 2.4395 | 1.5667 | 0.2751 | 25.17 | 23.16 | 0.0152 | 0.9375 |
| i-BUTANE | 0.3012 | 0.9704 | 0.5613 | 0.0985 | 9.82 | 9.06 | 0.0060 | 0.3657 |
| n-BUTANE | 0.2998 | 0.9658 | 0.5385 | 0.0945 | 9.80 | 9.05 | 0.0060 | 0.3651 |
| NEOPENTANE | 0.0993 | 0.3972 | 0.2167 | 0.0380 | 3.97 | 3.67 | 0.0025 | 0.1477 |
| i-PENTANE | 0.1001 | 0.4002 | 0.2087 | 0.0366 | 4.01 | 3.71 | 0.0025 | 0.1495 |
| n-PENTANE | 0.0999 | 0.3993 | 0.2060 | 0.0362 | 4.01 | 3.71 | 0.0025 | 0.1494 |
| NITROGEN | 2.4802 | 3.8505 | 1.5491 | 0.2718 | 0.00 | 0.00 | 0.0240 | 0.0000 |
| METHANE | 89.5968 | 79.6546 | 86.4960 | 0.0000 | 906.99 | 816.68 | 0.4963 | 33.7852 |
| CARBON DIOXIDE | 0.9989 | 2.4366 | 0.9699 | 0.1702 | 0.00 | 0.00 | 0.0152 | 0.0000 |
| ETHANE | 4.9957 | 8.3261 | 7.6104 | 1.3363 | 88.61 | 81.05 | 0.0519 | 3.3004 |
| TOTAL | 100.0000 | 100.0000 | 100.0000 | 1.9287 | 1053.97 | 951.55 | 0.6230 | 39.26 |
| | | | | | | | | |
| Compressibility Factor | 1.0024 | | | | | | | |
| Heating Value Gross BTU Dry | 1056.45 | | | | | | | |
| Heating Value Gross BTU Sat. | 1038.07 | | | | | | | |
| Heating Value Gross BTU Act. | 1056.45 | | | | | | | |
| Heating Value Net BTU Dry | 953.79 | | | | | | | |
| Heating Value Net BTU Sat. | 937.19 | | | | | | | |
| Heating Value Net BTU Act. | 953.79 | | | | | | | |
| Relative Density Gas Corr. | 0.6242 | | | | | | | |
| Gallons/1000 SCF C2+ | 1.9287 | | | | | | | |
| Gallons/1000 SCF C3+ | 0.5924 | | | | | | | |
| Gallons/1000 SCF C4+ | 0.3173 | | | | | | | |
| Gallons/1000 SCF C5+ | 0.1243 | | | | | | | |
| Gallons/1000 SCF C6+ | 0.0134 | | | | | | | |

Click the Cancel button to return to the Chromatogram Viewer dialog.

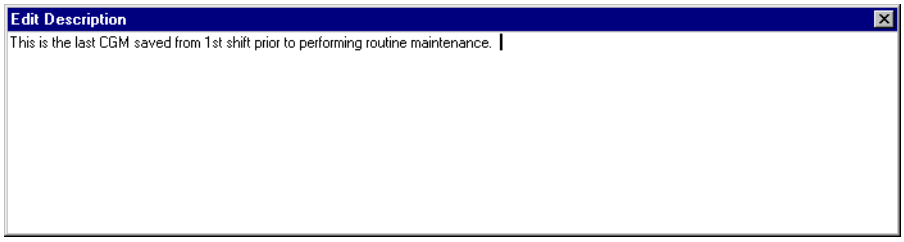
### 6.6.6 Entering a Description

To enter a description for the selected chromatogram,

1. Use the Chromatogram pull-down menu to select a specific chromatogram.




2. Click the Desc button. The Edit Description dialog appears.




3. Type the desired statement(s).
4. Press the ENTER key to accept this description.

   Use the ✕ button or press the ESC key to exit this dialog without accepting your entry.

5. Click the Save button to save this description with the chromatogram file.

**NOTICE**

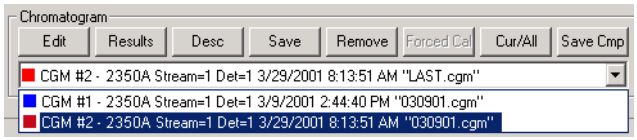
**The selected GC Archive chromatogram must be from a good calibration gas run.**

### 6.6.7 Forcing a Calibration

Use the Forced Cal function to calibrate the GC, using the raw data and stream number for the selected GC Archive chromatogram. The results are stored in the CDT under the corresponding stream number.

To perform a forced calibration,

1. Use the Chromatogram pull-down menu to select a specific chromatogram.

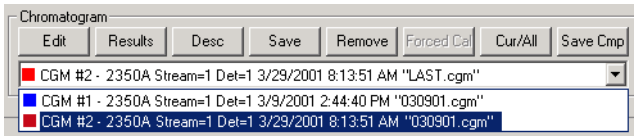



2. Click the Forced Cal button.

### 6.6.8 Toggling TEVs and CGM Components

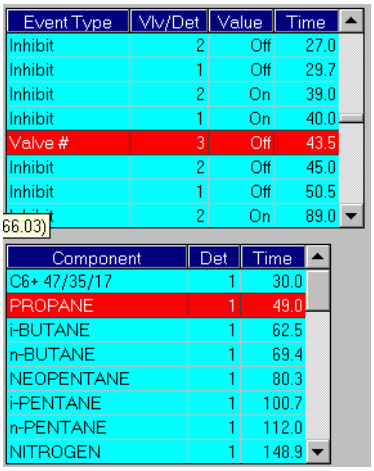
To toggle the display of the TEV and CGM Component speadsheets,

1. Use the Chromatogram pull-down menu to select a specific chromatogram.




2. Click the Cur/All button. If multiple CGMs are displayed in the graph area, the 'CUR/ALL' button toggles between showing all TEVs and all components for all CGMS to showing only the TEVs and components for the currently selected stream.

3. MON2000 toggles the display of the TEVs and Components spreadsheets and the CGM view.

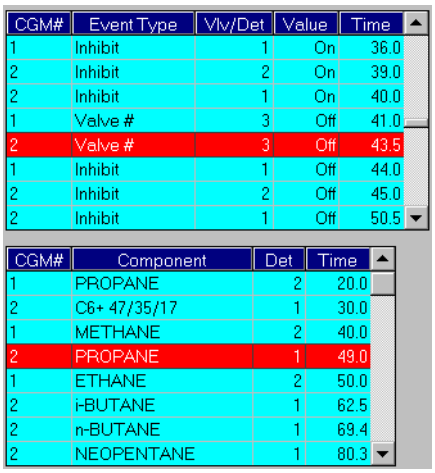


| Event Type | Vlv/Det | Value | Time |
|---|---|---|---|
| Inhibit | 2 | Off | 27.0 |
| Inhibit | 1 | Off | 29.7 |
| Inhibit | 2 | On | 39.0 |
| Inhibit | 1 | On | 40.0 |
| Valve # | 3 | Off | 43.5 |
| Inhibit | 2 | Off | 45.0 |
| Inhibit | 1 | Off | 50.5 |
| | 2 | On | 89.0 |

66.03)

| Component | Det | Time |
|---|---|---|
| C6+ 47/35/17 | 1 | 30.0 |
| PROPANE | 1 | 49.0 |
| i-BUTANE | 1 | 62.5 |
| n-BUTANE | 1 | 69.4 |
| NEOPENTANE | 1 | 80.3 |
| i-PENTANE | 1 | 100.7 |
| n-PENTANE | 1 | 112.0 |
| NITROGEN | 1 | 148.9 |

**Cur/All View 1**



| CGM# | Event Type | Vlv/Det | Value | Time |
|---|---|---|---|---|
| 1 | Inhibit | 1 | On | 36.0 |
| 2 | Inhibit | 2 | On | 39.0 |
| 2 | Inhibit | 1 | On | 40.0 |
| 1 | Valve # | 3 | Off | 41.0 |
| 2 | Valve # | 3 | Off | 43.5 |
| 1 | Inhibit | 1 | Off | 44.0 |
| 2 | Inhibit | 2 | Off | 45.0 |
| 2 | Inhibit | 1 | Off | 50.5 |

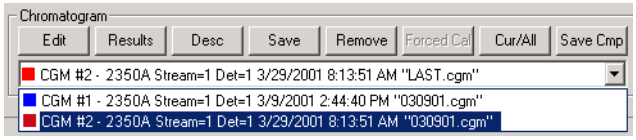
| CGM# | Component | Det | Time |
|---|---|---|---|
| 1 | PROPANE | 2 | 20.0 |
| 2 | C6+ 47/35/17 | 1 | 30.0 |
| 1 | METHANE | 2 | 40.0 |
| 2 | PROPANE | 1 | 49.0 |
| 1 | ETHANE | 2 | 50.0 |
| 2 | i-BUTANE | 1 | 62.5 |
| 2 | n-BUTANE | 1 | 69.4 |
| 2 | NEOPENTANE | 1 | 80.3 |

**Cur/All View 2**

## 6.7 VIEWING BASELINE DATA

Use the Baseline function to display the retention times and baselines for the selected chromatogram.

1. Use the Chromatogram pull-down menu to select a specific chromatogram.

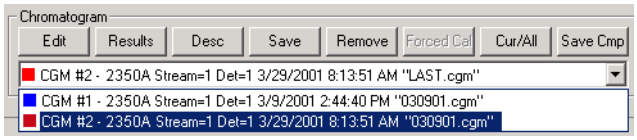



2. Click the Baselines button. This removes the integration lines from a displayed Archive CGM.
3. MON2000 displays a plot of the baseline values, and lists the corresponding retention times in the legend table.

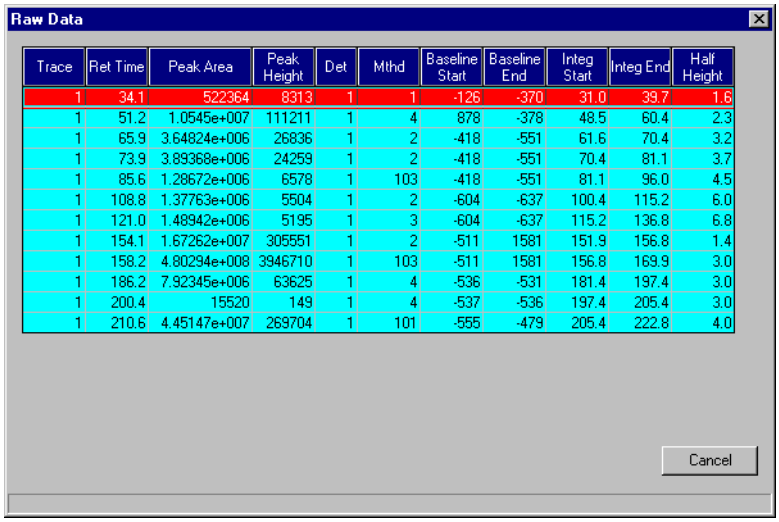
## 6.8 VIEWING RAW DATA

Use the Raw Data function to display the Raw Data Table for the selected chromatogram.

1. Use the Chromatogram pull-down menu to select a specific chromatogram.




2. Click the Raw Data button. The Raw Data dialog displays and shows the raw data for all CGMs in the graph area.




3. Click the Cancel button to return to the Chromatogram Viewer dialog.

## 6.9 DISPLAY OPTIONS

Right-click the graph area to access these options, or use the corresponding keystroke(s). Options are listed in alphabetical order.

See Table 6-1 for a complete listing of option names, descriptions, and keystroke sequences.

*Table 6-1 Display Options for Chromatogram Viewer*

| Keystroke | Right-Click Option | Description |
|---|---|---|
| CTRL C | Copy to clipboard | allows you to copy this graph to another application such as MSWord or Excel |
| F8 | Cursor to nearest point | snap cursor to nearest point in both the X and Y directions |
| CTRL V | Paste from clipboard | allows you to plot a range of points from another application such as MSWord or Excel |
| CTRL P | Print Graph Area | print currently displayed chromatograph area |
| CTRL S | Print Series All | print all displayed chromatograms |
| HOME | Restore State | restore last saved display settings for Live or Archived for the selected chromatogram |
| CTRL HOME | Save State | save current or archived display settings for the selected chromatogram |
| F4 | Toggle Coarse/Fine | toggle cursor from coarse (less accurate) to fine (more accurate) |
| F9 | Toggle Lines/Dots | toggle graph from line(s) to dots |
| CTRL F4 | Toggle Mouse Position Tip | graph cursor follows movement of mouse while tooltip displays exact coordinates of the current point |
| CTRL F9 | Toggle Nearest Point Tip | graph cursor follows movement of mouse cursor |
| NUM + | Zoom In | zoom in on entire graph |
| NUM – | Zoom Out | zoom out from entire graph |
| NUM → | Zoom X In | zoom in on X axis |
| NUM ← | Zoom X Out | zoom out from X axis |
| NUM ↑ | Zoom Y In | zoom in on Y axis |
| NUM ↓ | Zoom Y Out | zoom out from Y axis |

# REPORTS

**NOTICE**

**You must be currently online with the desired GC unit to generate a report from the controller.**

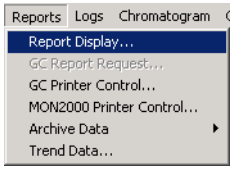
The options listed in the Reports menu enable you to display, print, or store various pre-configured GC reports.

See the following sections for more information on specific reports and related functions.

## 7.1 REPORT DISPLAY

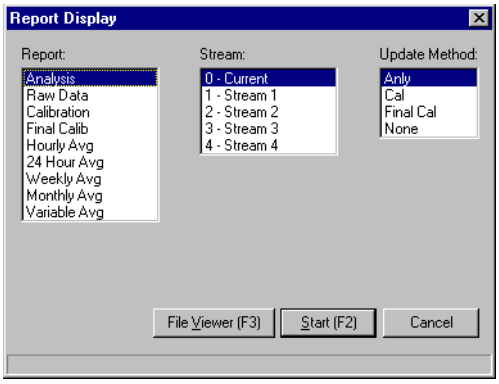
This function allows you to immediately display, print, or store preconfigured reports on GC analysis data. Data is reported either real-time from the GC unit or from previously stored files.

### 7.1.1 View Report from Live Data

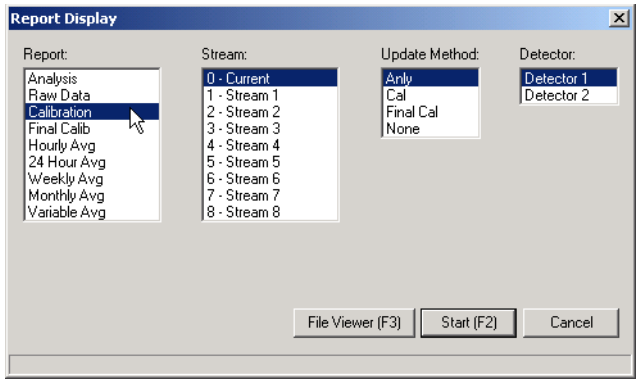



To display a report with live data from the GC unit,

1. Use the *Reports* > *Report Display* menu to access this function.
2. The Report Display dialog appears, per GC type.




**Report Display dialog for 2350A GC Controllers**




**Report Display dialog for Model 700 GC**

3. Select the report type, stream, and update setting from the lists provided.

*Table 7-1 Description of Report Display Settings*

| Setting | Description |
|---|---|
| Reports | list of pre-defined reports; Shows report type (Analysis, Raw Data, Calibration, etc...) |
| Select Stream | list of available streams<br><br>For a single detector GC:<br>0–Current = last stream analyzed<br><br>For a dual detector GC:<br>0–Current Det1 = last stream analyzed, Detector 1<br>0–Current Det2 = last stream analyzed, Detector 2 |
| Update Method | list of update options that determine when the report display is refreshed<br><br>Anly = after each analysis<br>Cal = after each calibration<br>Fcal = after each final calibration<br>None = not updated |

4. Click the Start (F2) button or press the F2 key to generate and display the selected report.

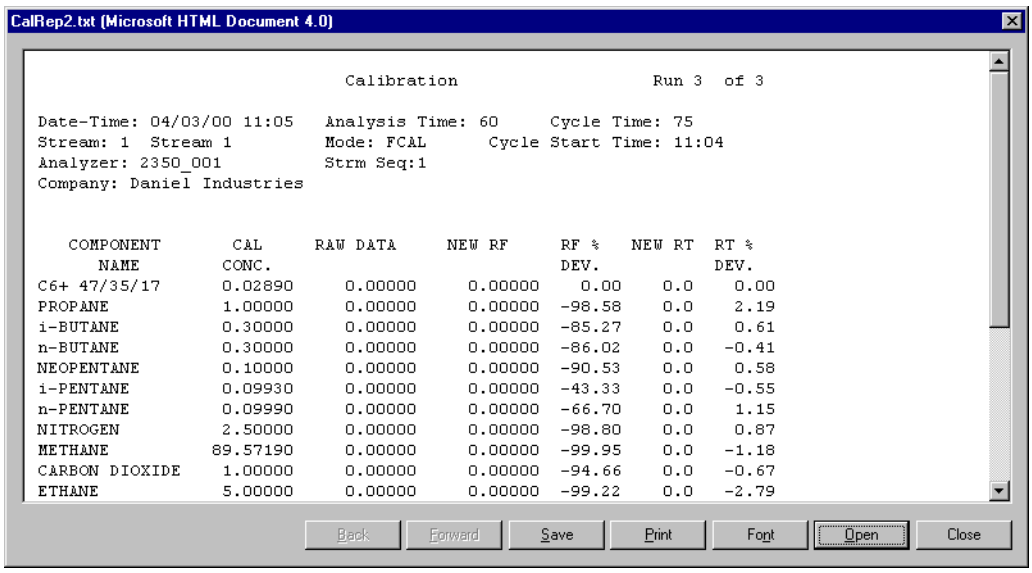
   To close this dialog without generating a report, click the Cancel button to return to the main window.

**NOTICE**

**The contents of the GC analysis reports are defined by:**

- **the GC application**
- **functions such as Calculations, User Defined, Limit Alarms, and Streams**

5. MON2000 generates the report, per your specifications, and displays the results in the File Viewer dialog.




MON2000 creates a temporary HTML file to display the generated report. If you want to save this report to disk, see Section 7.1.4.

**NOTICE**

**The display refreshes per the update setting configured in the Printer Control dialog (see Section 7.4).**

**For example, in the Report Display dialog, if Stream is set to "0–Current" and Update is set to "Anly", the report display will refre after the GC analyzes the stream selected via the Printer Control dialog.**

**The refresh function displays the newly generated report and deletes the previous report (unless already saved to disk).**

**Check the GC status bar for the run time and current stream.**

Use the scroll bars to see other areas of the report. Use the Font button to increase or decrease the font size displayed.

See the following sections for instructions printing the displayed file or opening other report files from disk.

6. Click the Close button or press the ESC key to exit this function and return to the Report Display dialog.

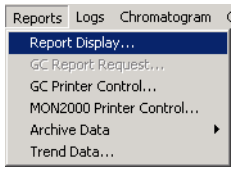
### 7.1.2 View Report from File

**NOTICE**

**MicroSoft Internet Explorer 5.0 (or later) is required to view a report file in HTML format.**

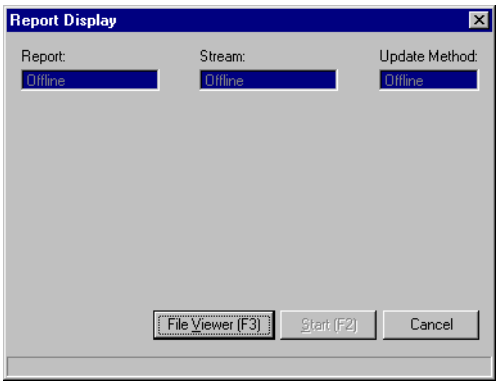
To open a report file for viewing,

1. Use the *Reports* > *Report Display* menu to access this function.



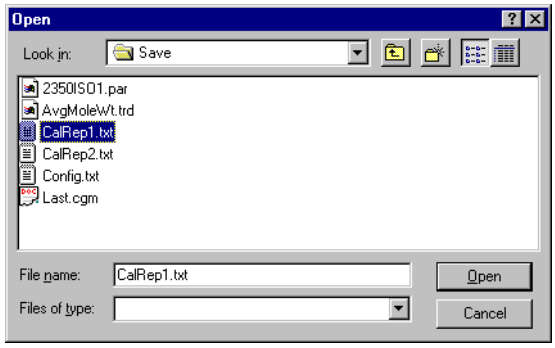

2. The Report Display dialog appears.

   If you are working in off-line mode, the Report Display dialog will appear blank.



3. Click the File Viewer (F3) button or press the F3 key to access the File Viewer dialog.

4. Click the Open button. The Open dialog appears.




**NOTICE**

**By default, the Open dialog displays the c:\GC\Save directory.**

5. Use the provided directory tree to select the desired report file. Click the Open button.
6. MON2000 opens the file and displays it in the File Viewer dialog.

   Use the scroll bars to see other areas of the report. Use the Font button to increase or decrease the font size displayed.

Use the Back and Forward buttons to browse through multiple report files.

7. Click the Close button or press the ESC key to return to the Report Display dialog.

### 7.1.3 Print Report

To print a report,

**NOTICE**

**The refresh function displays a newly generated report and deletes the currently displayed report (see Section 7.1.1 for details).**

**You should print or save the current report immediately after it is displayed.**

1. Display a live report or open a report file from disk. See Section 7.1.1 or Section 7.1.2 for details.
2. Click the Print button.
3. MON2000 prints the report to your configured printer (see Section 3.7).

### 7.1.4 Save Report to Disk

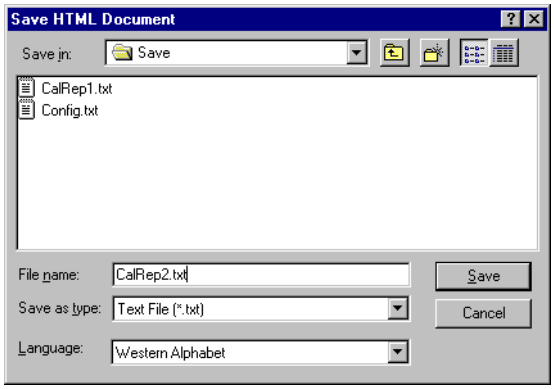
To save a report to disk,

1. Display a live report or open a report file from disk. See Section 7.1.1 or Section 7.1.2 for details.

2. Click the Save button. The Save HTML Document dialog appears.

**NOTICE**

**MicroSoft Internet Explorer 5.0 (or later) is required to view a report file in HTML format.**




3. Select the directory in which you want to save this report and type the desired name.

**NOTICE**

**You can save the report in any of these formats:**

- **.txt, ASCII Tab-delimited**
- **.cvs, Comma-deliminted**
- **.xls, Excel**
- **.htm, HTML**
- **.xml, EXtensible Markup Language**

Note that the default location is **c:\GC\Save**.

4. Click the Save button.

### 7.1.5 Report Contents

This section includes examples of the following reports: Analysis, Raw Data, Calibration, 24-Hour Average, Weekly Average, Hourly Average, and Variable Average. After each sample report, a table describes the contents and identifies which functions affect the data.

Each report contains the header information, including:

*Table 7-2 Contents Guide for Report Headers*

| Content | Related Function(s) | Menu | Section |
|---|---|---|---|
| Date-Time | standard GC application | n/a | n/a |
| Analysis Time | Timed Events Table (TEV) | Application > Timed Events [F5] | 5.3 |
| Cycle Time | TEV | Application > Timed Events [F5] | 5.3 |
| Stream | Report Display, Select Stream | Reports > Report Display | 7.1 |
| | Stream Name | Application > Streams | 5.8 |
| Mode | standard GC application | n/a | n/a |
| Cycle Start Time | standard GC application | n/a | n/a |
| Analyzer | System, Analyzer Name | Application > System | 5.1 |
| Strm Seq | System, Stream Sequence | Application > System | 5.1 |
| Report Header (optional) | User Defined, Text Strings | Application > User Defined > Text Strings | 5.4.3 |

## Analysis Report

Date-Time: 03/24/95 12:24 Analysis Time: 225 Cycle Time: 240
Stream: 3 Stream 3 Mode: ANLY Cycle Start Time: 12:20
Analyzer: AT401STD Strm Seq:1,2,3,4,5,6,7,8
Company: Daniel Industries, Houston, TX

| Component Name | Mole Percent | Weight Percent | LiqVol Percent | Gallons/ 1000 SCF | BTU Gross | BTU Net | Relative Density |
|---|---|---|---|---|---|---|---|
| C6+ 47/35/17 | 0.0187 | 0.1076 | 0.0488 | 0.0083 | 0.99 | 0.92 | 0.0006 |
| PROPANE | 0.4922 | 1.3011 | 0.7918 | 0.1364 | 12.41 | 11.42 | 0.0075 |
| i-BUTANE | 0.0998 | 0.3477 | 0.1906 | 0.0326 | 3.25 | 3.00 | 0.0020 |
| n-BUTANE | 0.1017 | 0.3543 | 0.1872 | 0.0321 | 3.33 | 3.07 | 0.0020 |
| NEOPENTANE | 0.0493 | 0.2132 | 0.1102 | 0.0189 | 1.97 | 1.82 | 0.0012 |
| i-PENTANE | 0.0500 | 0.2162 | 0.1068 | 0.0183 | 2.01 | 1.85 | 0.0012 |
| n-PENTANE | 0.0502 | 0.2171 | 0.1062 | 0.0182 | 2.02 | 1.87 | 0.0013 |
| NITROGEN | 0.5624 | 0.9443 | 0.3599 | 0.0616 | 0.00 | 0.00 | 0.0054 |
| METHANE | 97.1656 | 93.4236 | 96.1229 | 16.4696 | 983.61 | 885.66 | 0.5382 |
| CARBON DIOXIDE | 0.3987 | 1.0518 | 0.3967 | 0.0679 | 0.00 | 0.00 | 0.0061 |
| ETHANE | 1.0114 | 1.8230 | 1.5789 | 0.2706 | 17.94 | 16.41 | 0.0105 |
| TOTALS | 100.0000 | 100.0000 | 100.0000 | 0.6649 | 1027.52 | 926.02 | 0.5761 |

'*' indicates user-defined components

Compressibility Factor (1/Z) @ 14.730 PSIA & 60.0 DEG. F = 1.0021

| Base Pressures | | 14.730 | 15.550 | |
|---|---|---|---|---|
| Gross Dry BTU | = | 1029.67 | 1086.99 | Corrected/Z |
| Gross SAT BTU | = | 1011.75 | 1068.08 | Corrected/Z |
| Actual Gross BTU | = | 1029.67 | 1086.99 | Corrected/Z |
| Net Dry BTU | = | 927.96 | 979.62 | Corrected/Z |
| Net SAT BTU | = | 911.81 | 962.57 | Corrected/Z |
| Actual Net BTU | = | 927.96 | 979.62 | Corrected/Z |
| Total GPM C2+ | = | 0.6649 | 0.7020 | |
| Total GPM C3+ | = | 0.3328 | 0.3513 | |
| Total GPM C4+ | = | 0.1284 | 0.1356 | |
| Real Relative Density Gas | = | 0.5771 | | |
| Real Relative Density Lqd | = | 0.3087 | | |
| WOBBE | = | 1331.89 | | |
| Gas Density | = | 44.143 | lb/1000 cu.ft. at 14.73 PSIA and 60 Deg.F | |
| Liquid Density | = | 2.572 | lb/gal | |
| Reid Vapor Pressure | = | 4867.46 | PSIA | |

User Defined Calculations

| Label | Value |
|---|---|
| test | 0.10 |

ACTIVE ALARMS

*Table 7-3 Contents Guide for Analysis Report*

| Content | Related Function(s) | Menu | Section |
|---|---|---|---|
| Component Name | Component Data Table (CDT) | Application > Component Data [F6] | 5.2 |
| GC Analysis Data variables (std) | Calculations, Control | Application > Calculations > Control | 5.5.1 |
| GC Analysis Data variables (user) | Calculations, User Defined | Application > Calculations > User Defined | 5.5.3 |
| Alarms | Limit Alarms | Application > Limit Alarms | 5.6 |
| Additional Base Pressures | Compress(ibility) enabled | Application > Calculations > Control | 5.5.1 |
| | Streams, Optional Pressure | Application > Streams | 5.8 |

## Raw Data Report

```
Date-Time: 03/24/95 12:24  Analysis Time: 225    Cycle Time: 240
Stream: 3  Stream 3        Mode: ANLY      Cycle Start Time: 12:20
Analyzer:  AT401STD        Strm Seq: 1,2,3,4,5,6,7,8
Company: Daniel Industries, Houston, TX
```

| No. | RETENTION TIME | PEAK AREA | PEAK HEIGHT | DET | MTHD | INTEGRATION START | INTEGRATION END | Peak Width Half Height |
|---|---|---|---|---|---|---|---|---|
| 1 | 25.7 | 1640. | 44. | 1 | 2 | 24.0 | 26.5 | 0.7 |
| 2 | 29.0 | 24864. | 409. | 1 | 3 | 26.5 | 33.6 | 1.4 |
| 3 | 48.8 | 3.66064e+005 | 4707. | 1 | 4 | 46.4 | 56.8 | 1.8 |
| 4 | 63.5 | 86164. | 792. | 1 | 2 | 59.5 | 68.0 | 2.5 |
| 5 | 71.5 | 90836. | 737. | 1 | 2 | 68.0 | 78.1 | 2.9 |
| 6 | 82.6 | 45000. | 299. | 1 | 3 | 78.1 | 90.3 | 3.6 |
| 7 | 105.7 | 49350. | 261. | 1 | 2 | 99.2 | 112.3 | 4.5 |
| 8 | 117.8 | 50382. | 244. | 1 | 3 | 112.3 | 127.7 | 4.9 |
| 9 | 145.6 | 2.4774e+005 | 4635. | 1 | 2 | 142.9 | 148.6 | 1.3 |
| 10 | 150.1 | 3.50245e+007 | 3.2258e+005 | 1 | 3 | 148.6 | 167.8 | 2.7 |
| 11 | 177.6 | 2.0876e+005 | 1804. | 1 | 1 | 173.1 | 189.4 | 2.8 |
| 12 | 203.6 | 5.87488e+005 | 3868. | 1 | 1 | 196.6 | 215.6 | 3.7 |

*Table 7-4 Contents Guide for Raw Data Report*

| Content | Related Function(s) | Menu | Section |
|---|---|---|---|
| Retention Time<br>Peak Area<br>Peak Height<br>Det(ector)<br>Integration Start/End<br>Peak Width 1/2 Height | standard GC application | n/a | n/a |
| Mthd (method) | standard GC application, peak derivation method (non-edit) | Chromatogram Viewer | 6.2.1 |

### Calibration Report

```
                              Calibration                    Run 1  of 1

Date-Time: 03/24/95 12:28   Analysis Time: 225    Cycle Time: 240
Stream: 4   Stream 4        Mode: ANLY      Cycle Start Time: 12:24
Analyzer: AT401STD          Strm Seq:1,2,3,4,5,6,7,8
Company: Daniel Industries, Houston, TX


   COMPONENT        CAL      RAW DATA      NEW RF      RF %   NEW RT  RT %
     NAME         CONC.                               DEV.           DEV.
C6+ 47/35/17      0.02000 24840.00000  1.242e+006    -9.07    29.0    0.35
PROPANE           0.50000  3.66212e+5  7.32424e+5    -4.24    48.8    0.00
i-BUTANE          0.10000 86320.00000  8.632e+005    -2.76    63.5   -0.31
n-BUTANE          0.10000 90784.00000   9.0784e+5    -1.16    71.5   -0.28
NEOPENTANE        0.05000 45084.00000   9.0168e+5    -3.90    82.6   -0.36
i-PENTANE         0.05000 48978.00000   9.7956e+5    -3.46  105.7    -0.56
n-PENTANE         0.05000 50064.00000  1.00128e+6    -2.99  117.8    -0.76
NITROGEN          0.60000   2.4768e+5  4.128e+005    -8.88  145.6    0.00
METHANE          97.13000  3.50394e+7  3.60747e+5    -2.69  150.1    -0.20
CARBON DIOXIDE    0.40000  2.09216e+5   5.2304e+5    -2.88  177.6    -0.17
ETHANE            1.00000  5.88496e+5  5.88496e+5    -1.49  203.6    0.25

ACTIVE ALARMS
```

*Table 7-5 Contents Guide for Calibration Report*

| Content | Related Function(s) | Menu | Section |
|---|---|---|---|
| Component Name<br>Cal. Conc. | CDT | Application > Component Data [F6] | 5.2 |
| Raw Data<br>New RF<br>RF % Dev.<br>New RT<br>RT % Dev. | CDT (additional columns) | Application > Component Data [F6] | 5.2 |
| Alarms | Limit Alarms | Application > Limit Alarms | 5.6 |

**NOTICE**

**Streams used for analysis display "0"s in the calibration raw data columns (see Section 5.8)**

## Final Calibration Report

```
Date-Time: 03/24/95 12:28   Analysis Time: 225    Cycle Time: 240
Stream: 4   Stream 4        MODE:  ANLY     Cycle Start Time: 12:24
Analyzer: AT401STD          Strm Seq:1,2,3,4,5,6,7,8
Company: Daniel Industries, Houston, TX
```

| Component Name | Cal Conc. | Old RF | New RF | * | RF % DEV. | Old RT | New RT | * | RT % DEV. |
|---|---|---|---|---|---|---|---|---|---|
| C6+ 47/35/17 | 0.03000 | 1.92126e+6 | 1.91453e+6 | * | -0.35 | 34.3 | 34.3 | * | -0.15 |
| PROPANE | 1.00300 | 1.11689e+6 | 1.11696e+6 | * | 0.01 | 50.8 | 50.8 | * | 0.00 |
| i-BUTANE | 0.30100 | 1.28687e+6 | 1.28641e+6 | * | -0.04 | 65.8 | 65.8 | * | 0.00 |
| n-BUTANE | 0.30200 | 1.32258e+6 | 1.32091e+6 | * | -0.13 | 73.5 | 73.4 | * | -0.07 |
| NEOPENTANE | 0.10000 | 1.39596e+6 | 1.39382e+6 | * | -0.15 | 86.0 | 86.0 | * | 0.06 |
| i-PENTANE | 0.09990 | 1.4712e+6 | 1.47663e+6 | * | 0.37 | 108.3 | 108.3 | * | 0.00 |
| n-PENTANE | 0.10000 | 1.51914e+6 | 1.52511e+6 | * | 0.39 | 120.2 | 120.2 | * | 0.00 |
| NITROGEN | 2.44300 | 726661.0000 | 726170.0000 | * | -0.07 | 145.1 | 145.1 | * | 0.00 |
| METHANE | 89.61810 | 585512.0000 | 585221.0000 | * | -0.05 | 149.4 | 149.4 | * | 0.00 |
| CARBON DIOXIDE | 1.00400 | 861074.0000 | 861836.0000 | * | 0.09 | 179.9 | 179.9 | * | 0.00 |
| ETHANE | 4.99900 | 953873.0000 | 953929.0000 | * | 0.01 | 207.2 | 207.1 | * | -0.02 |

```
ACTIVE ALARMS
```

*Table 7-6 Contents Guide for Final Calibration Report*

| Content | Related Function(s) | Menu | Section |
|---|---|---|---|
| Component Name<br>Cal. Conc. | CDT | Application > Component Data [F6] | 5.2 |
| Old RF<br>New RF<br>RF % Dev.<br>Old RT<br>New RT<br>RT % Dev. | standard GC application<br><br>results of final calibration, adjustments to response factors (RFs) and retention times (RTs)<br><br>CDT (additional columns) | Application > Component Data [F6] | 5.2 |
| Alarms | Limit Alarms | Application > Limit Alarms | 5.6 |

**NOTICE**

**Report items marked with an asterisk (*) were updated during calibration.**

### Average Reports

There are five types of Average Reports:

- Hourly Average Report
- 24-Hour Average Report
- Weekly Average Report
- Monthly Average Report
- Variable Average Report

### Sample 24-Hour Average Report

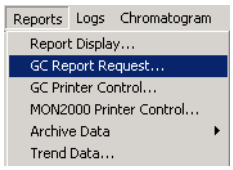
```
24 Hour Averages from Mon Apr 03 10:50:58 1995 Analyzer: AT401STD
 Company: Daniel Industries, Houston, TX

1   Mole Percent                  S: 1 Stream 1     C: 1 C6+ 47/35/17
  Start: Mon Apr 03 06:00:00 1995 Stop: Tue Apr 04 06:00:00 1995
                                Average       Minimum       Maximum   Samples
  Current                        10.03610       2.25780      23.63960       8
  1 Mon Apr 03 06:00:00 1995      0.20443       0.01870       2.43300      37
  2 Sun Apr 02 07:00:00 1995      0.01918       0.01900       0.01940      39
  3 Sat Apr 01 06:00:00 1995      0.01918       0.01900       0.01940      38
2   Mole Percent                  S: 1 Stream 1     C: 2 PROPANE
  Start: Mon Apr 03 06:00:00 1995 Stop: Tue Apr 04 06:00:00 1995
                                Average       Minimum       Maximum   Samples
  Current                        0.00000       0.00000       0.00000       8
  1 Mon Apr 03 06:00:00 1995     3.74130       0.00000       4.79480      37
  2 Sun Apr 02 07:00:00 1995     4.78225       4.77260       4.79290      39
  3 Sat Apr 01 06:00:00 1995     4.78240       4.77300       4.78990    3824
•
•
•
13  Net Heating Value (Dry)       S: 1 Stream 1
  Start: Mon Apr 03 06:00:00 1995 Stop: Tue Apr 04 06:00:00 1995
                                Average       Minimum       Maximum   Samples
  Current                      2551.31000    1403.71000    4175.43000       8
  1 Mon Apr 03 06:00:00 1995   1024.18000     906.22600    1647.33000      37
  2 Sun Apr 02 07:00:00 1995    988.18100     988.03000     988.36700      39
  3 Sat Apr 01 06:00:00 1995    988.18600     988.03300     988.30000      38
```

*Table 7-7 Contents Guide for Average Reports*

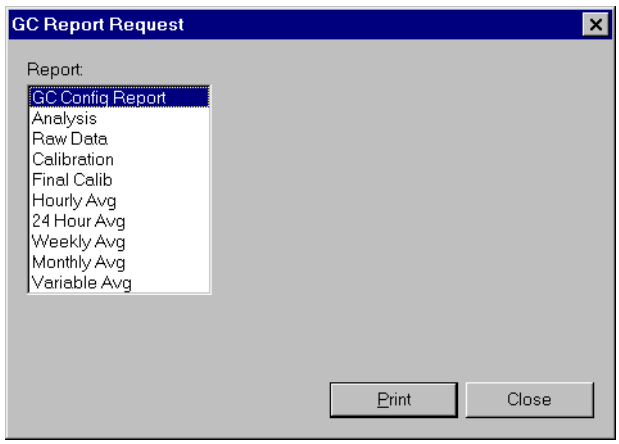
| Content | Related Function(s) | Menu | Section |
|---|---|---|---|
| Item Number<br>Analysis data/calculation<br>Stream<br>Component | Calculations, Averages | Application > Calculations > Averages | 5.5.2 |
| Old RF<br>New RF<br>RF % Dev.<br>Old RT<br>New RT<br>RT % Dev. | standard GC application<br><br>results of ongoing or completed averages | n/a | n/a |

## 7.2 GC REPORT REQUEST




This function allows you to send a report to a printer connected to the GC Controller.

1. Use the *Reports* > *GC Report Request* menu to access this function.
2. The GC Report Request dialog appears.



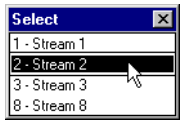
3. Select the report you wish to print.

**NOTICE**

**The GC Config Report is a snapshot of the PC Config Report. Contents include:**

- **current alarms**
- **streams**
- **control calculations**
- **CDTs**
- **TEVs**
- **GC serial port settings**
- **analog outputs**

**See Appendix A for a sample PC Config Report.**




For reports other than the GC Config, a Streams list displays.

Double-click the appropriate stream and the controller sends the report to the printer.

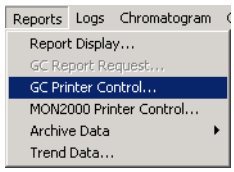
Click the Print button. Double-click the appropriate stream and the print process begins.

Click the Cancel button to abort and return to the main window.

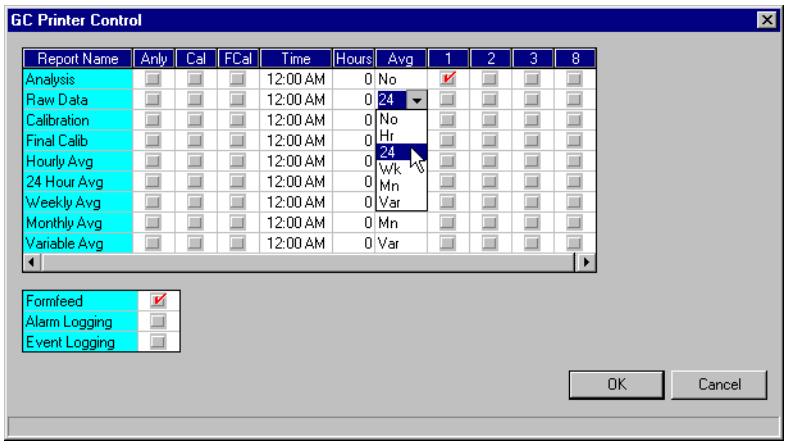
## 7.3 GC PRINTER CONTROL

This function allows you to define schedules for automatic printing of standard GC reports to a printer connected to the GC Controller.

1. Use the *Reports > GC Printer Control* menu to access this function.



2. The GC Printer Control dialog displays.




**NOTICE**

**You can, for example, set a report to print after each analysis and every 12 hours.**

3. Use the provided data fields, check and combo boxes to select the desired settings. See Table 7-8 for detailed descriptions.

4. Click the OK button to accept your selections and return to the main window.

   Click the Cancel button to abort and return to the main window.

*Table 7-8 Description of Settings for GC Printer Control*

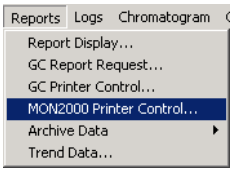
| Setting | Description |
|---|---|
| Anly | enable/disable report printing after each analysis run regardless of report type selected |
| Cal | enable/disable report printing after each calibration run regardless of report type selected |
| FCal | enable/disable report printing after every final calibration run regardless of report type selected |
| Time | time at which report should print (every 24 hours)<br><br>00:00 = disables 24-hour setting<br>12:00 AM = disables 12-hour setting<br><br>Note that the Time setting will override the Hours setting.<br><br>This setting only applies to streams enabled (i.e., checked ON) for report printing. |

*Table 7-8 Description of Settings for GC Printer Control (Continued)*

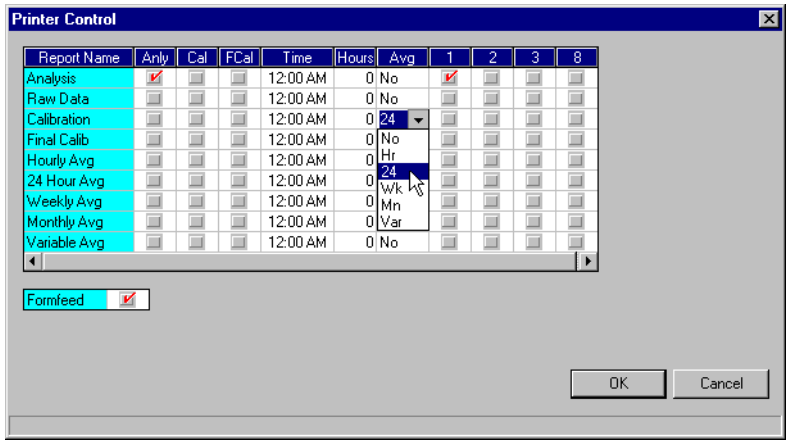
| Setting | Description |
|---|---|
| Hours | hour interval at report should print<br><br>Use this setting for intervals less than 24 hours. For example, use this setting if you wish to print a report every 8 hours. Ensure that the Time value is "00:00" to disable the 24-hour setting or "12:00 AM" to disable the 12-hour setting.<br><br>This setting only applies to streams enabled (i.e., checked ON) for report printing. |
| Avg | average type to be used in the report calculations; calculations are dependent on settings in the Averages Calculations dialog (see Section 5.5.2)<br><br>No = disabled<br>Hr = hourly avg<br>24 = 24-hour avg<br>Wk = weekly avg<br>Mn = monthly avg<br>Var = variable avg |
| <numbered columns> | streams to be used for data collection when the report is generated |
| Form Feed | enable/disable manual paper feed feature of printer |
| Alarm Logging | enable/disable real-time printing of alarms as they occur |
| Event Logging | enable/disable real-time printing of events as they occur |

## 7.4 MON2000 PRINTER CONTROL

This function allows you to define schedules for automatic printing of standard GC reports to a printer connected to your PC. See Section 3.7 to configure the printer settings. The user must be on-line (connected to the controller) using either a serial port direct connection, modem or Ethernet card in order to print from the MON2000 printer.




1. Use the *Reports* > MON2000 *Printer Control* menu to access this function.
2. The Printer Control dialog displays.




**NOTICE**

**You can, for example, set a report to print after each analysis and every 12 hours.**

**Each report generation interrupts all current functions.**

Use the provided data fields, check and combo boxes to select the desired settings. See Table 7-9 for detailed descriptions.

3. Click the OK button to accept your selections and return to the main window.

   Click the Cancel button to abort and return to the main window.

*Table 7-9 Description of Settings for MON2000 Printer Control*

| Setting | Description |
|---|---|
| Anly | enable/disable report printing after each analysis run regardless of report type selected |
| Cal | enable/disable report printing after each calibration run regardless of report type selected |
| FCal | enable/disable report printing after every final calibration run regardless of report type selected |
| Time | time at which report should print (every 24 hours)<br><br>00:00 = disables 24-hour setting<br>12:00 AM = disables 12-hour setting<br><br>Note that the Time setting will override the Hours setting. |

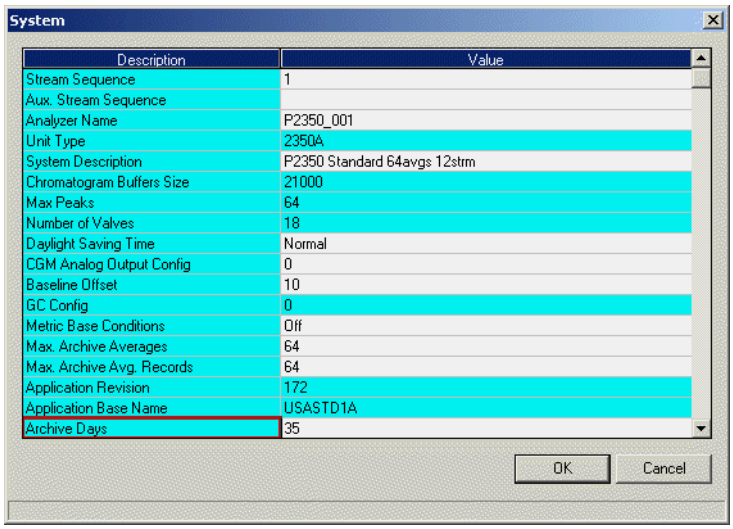
*Table 7-9 Description of Settings for MON2000 Printer Control (Continued)*

| Setting | Description |
|---|---|
| Hours | hour interval at report should print<br><br>Use this setting for intervals less than 24 hours. For example, use this setting if you wish to print a report every 8 hours. Ensure that the Time value is "00:00" to disable the 24-hour setting or "12:00 AM" to disable the 12-hour setting. |
| Avg | average type to be used in the report calculations; calculations are dependent on settings in the Averages Calculations dialog (see Section 5.5.2)<br><br>No = disabled<br>Hr = hourly avg<br>24 = 24-hour avg<br>Wk = weekly avg<br>Mn = monthly avg<br>Var = variable avg |
| <numbered columns> | streams to be used for data collection when the report is generated |
| Form Feed | enable/disable manual paper feed feature of printer |

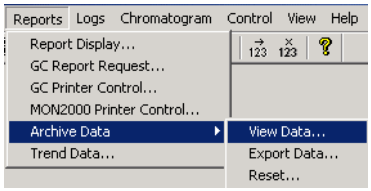
## 7.5 ARCHIVE DATA

This function enables you to view, print, or save various reports and records stored in the GC memory for the Model 500 and Model 700 analyzers. You can also reset (i.e., delete) the stored records from the GC memory.

The standard GC application can store up to ninety-nine days of analysis runs and calibration records.

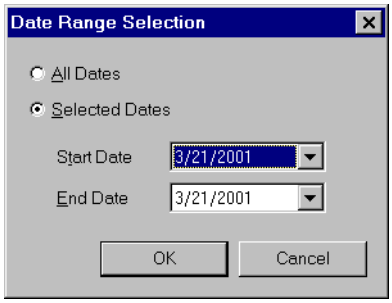



### 7.5.1 View Data Model 500/Model 700




To view, print, copy or save archived data,

1. Use the *Reports* > *Archive Data* > *View Data* menu to access this function.
2. MON2000 displays the Date Range Selection pop-up dialog.




Select **`All Dates`** radio button or choose **`Selected Dates`**. Select the Start date and End Date (date range) for the report to be archived.

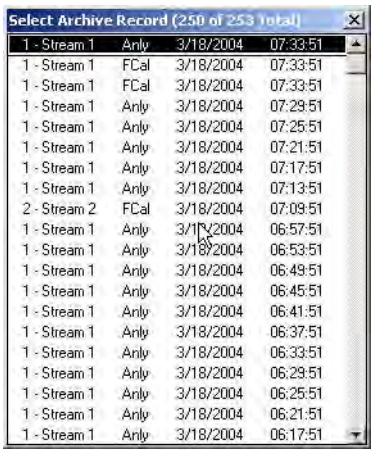
3. Click the OK button to apply your selection.

   Or,

   Click the Cancel button to return to the View Data window.

   MON2000 displays the message "Reading GC Data" in the status bar.

4. The Select Archive Record dialog appears.




   Double-click the desired archived report or record. (If no records are found, an information dialog displays.) Select a range (multiple) of records to archive by left-clicking the mouse at the beginning record and dragging the pointer to the last record to be archived. Then, press the **ENTER** key.

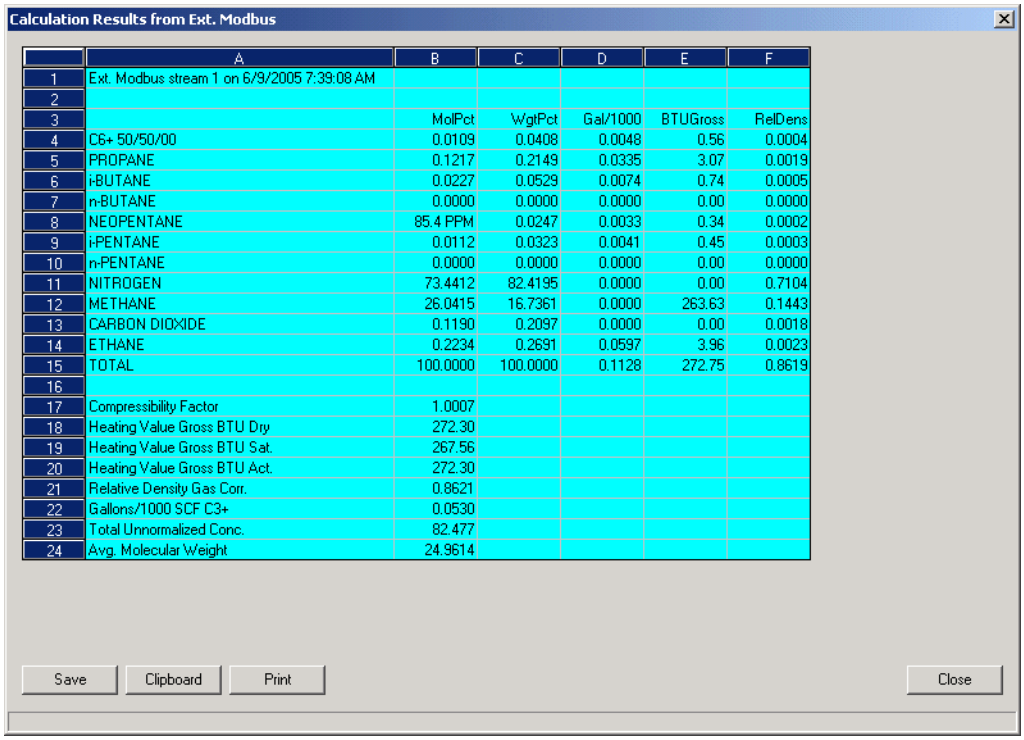
   Or,

   Left-click the mouse pointer on the beginning record, then move the mouse pointer to another location (either further up or down the list) and while holding down the **Shift** key, click the ending record. All highlighted records will be automatically selected. Press the **Enter** key to display all of the selected records.

**NOTICE**

**MON2000 limits the number of viewable Archived Records to 100.**

5. The Calculation Results from Ext. Modbus window appears.




| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 | Ext. Modbus stream 1 on 6/9/2005 7:39:08 AM | | | | | |
| 2 | | | | | | |
| 3 | | MolPct | WgtPct | Gal/1000 | BTUGross | RelDens |
| 4 | C6+ 50/50/00 | 0.0109 | 0.0408 | 0.0048 | 0.56 | 0.0004 |
| 5 | PROPANE | 0.1217 | 0.2149 | 0.0335 | 3.07 | 0.0019 |
| 6 | i-BUTANE | 0.0227 | 0.0529 | 0.0074 | 0.74 | 0.0005 |
| 7 | n-BUTANE | 0.0000 | 0.0000 | 0.0000 | 0.00 | 0.0000 |
| 8 | NEOPENTANE | 85.4 PPM | 0.0247 | 0.0033 | 0.34 | 0.0002 |
| 9 | i-PENTANE | 0.0112 | 0.0323 | 0.0041 | 0.45 | 0.0003 |
| 10 | n-PENTANE | 0.0000 | 0.0000 | 0.0000 | 0.00 | 0.0000 |
| 11 | NITROGEN | 73.4412 | 82.4195 | 0.0000 | 0.00 | 0.7104 |
| 12 | METHANE | 26.0415 | 16.7361 | 0.0000 | 263.63 | 0.1443 |
| 13 | CARBON DIOXIDE | 0.1190 | 0.2097 | 0.0000 | 0.00 | 0.0018 |
| 14 | ETHANE | 0.2234 | 0.2691 | 0.0597 | 3.96 | 0.0023 |
| 15 | TOTAL | 100.0000 | 100.0000 | 0.1128 | 272.75 | 0.8619 |
| 16 | | | | | | |
| 17 | Compressibility Factor | 1.0007 | | | | |
| 18 | Heating Value Gross BTU Dry | 272.30 | | | | |
| 19 | Heating Value Gross BTU Sat. | 267.56 | | | | |
| 20 | Heating Value Gross BTU Act. | 272.30 | | | | |
| 21 | Relative Density Gas Corr. | 0.8621 | | | | |
| 22 | Gallons/1000 SCF C3+ | 0.0530 | | | | |
| 23 | Total Unnormalized Conc. | 82.477 | | | | |
| 24 | Avg. Molecular Weight | 24.9614 | | | | |

Use the ✕ button or press the ESC key to exit this function and return to the main window.

As applicable, use the scroll bars to see other areas of the record.

6. To print, copy to the clipboard, or save the report to disk, right-click the Archive Data sheet and select the desired option from the popup menu.

   Or, use the Print, Clipboard or Save buttons for these functions.

   Use the Save File dialog to choose the directory location and file name.

   **NOTICE**

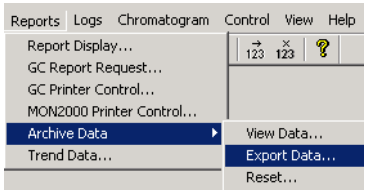
   **You can save the report in any of these formats:**

   - **.txt, ASCII Tab-delimited**
   - **.cvs, Comma-deliminted**
   - **.xls, Excel**
   - **.htm, HTML**
   - **.xml, EXtensible Markup Language**

7. Click the Cancel button to return to the main window.

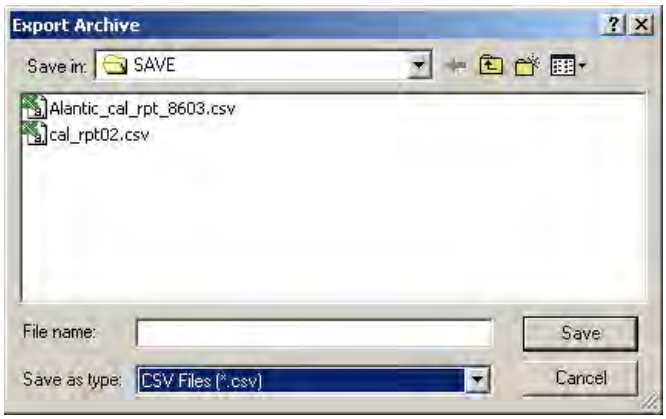
### 7.5.2 Archive Export Data

Use this function to export data files for review at a later time.

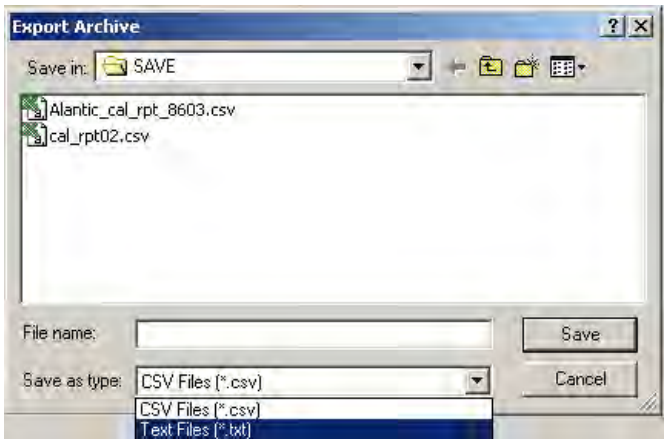



From the *Reports>Archive Data>Export Data* menu,

1. Click Export Data and the Export Archive window displays.



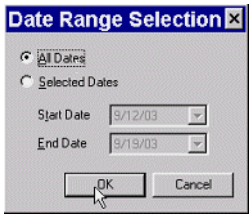

2. The exported data file is saved in the default (GC>Directory). Use the pull-down menu to save the data file to a different directory.
3. Click an existing file (to write over an existing file) or enter a 'new' file name in the 'Data Field'.
4. Save the file as either:
   - .csv (spreadsheet application format)
   - .txt (Word Pad or Note Pad application format)



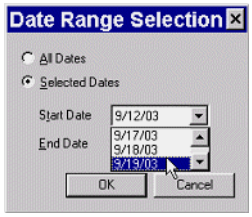
If the GC you are using is a Model 2350A, the Data Selection Range' dialog appears. Choose the date range as:

- All dates (radio button) or,
- Selected Dates (radio button)
- Start date
- End date

Also note that the Date Range dialog only displays when files are archived for more than one day.

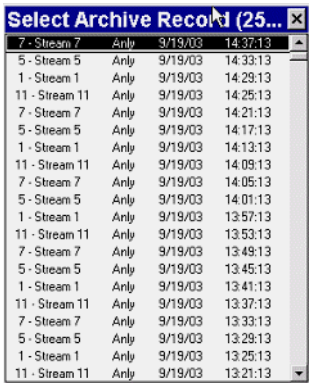



**Default Settings**

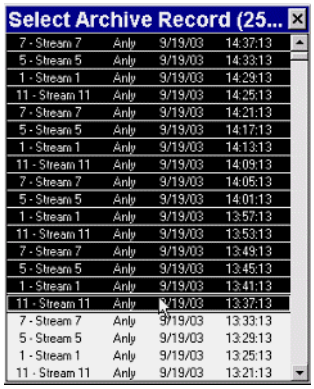



**Date Range Selection**

5. Click the OK button to apply your selection. Click the Cancel button to abort and return to the Trend Data window.
6. The Select Archive Records dialog appears.




**Select Archive Record Default**



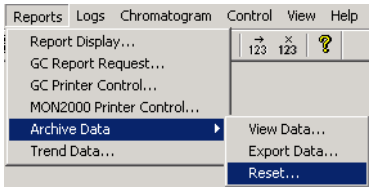

**Select Archive Record Selection**

To Select all records, the operator may drag the slide bar down to the end of the list, then while holding down the 'Shift' key click the last report and MON2000 will automatically select all records in between. This also works for any number of records within the list.

The operator may select several records individually by holding down the 'Ctrl' key and clicking the mouse pointer on random selected reports. Reports that are several hours apart may be viewed in this manner.

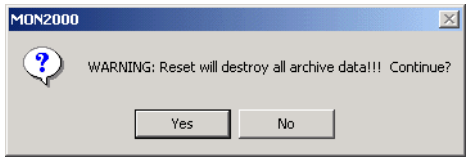
Or, as the example .BMP above shows, the operator may click a report and drag the mouse pointer down, highlighting several reports in sequential order.

### 7.5.3 Reset




To delete archived data and reset the GC Controller memory,

1. Use the *Reports* > *Archive Data* > *Reset* menu to access this function.
2. MON2000 displays a confirmation dialog.




Click the

button to continue.

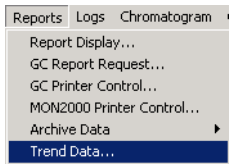
3. MON2000 clears the GC Controller memory. New archived records will begin accumulating again as analysis and calibration runs occur.

## 7.6 TREND DATA

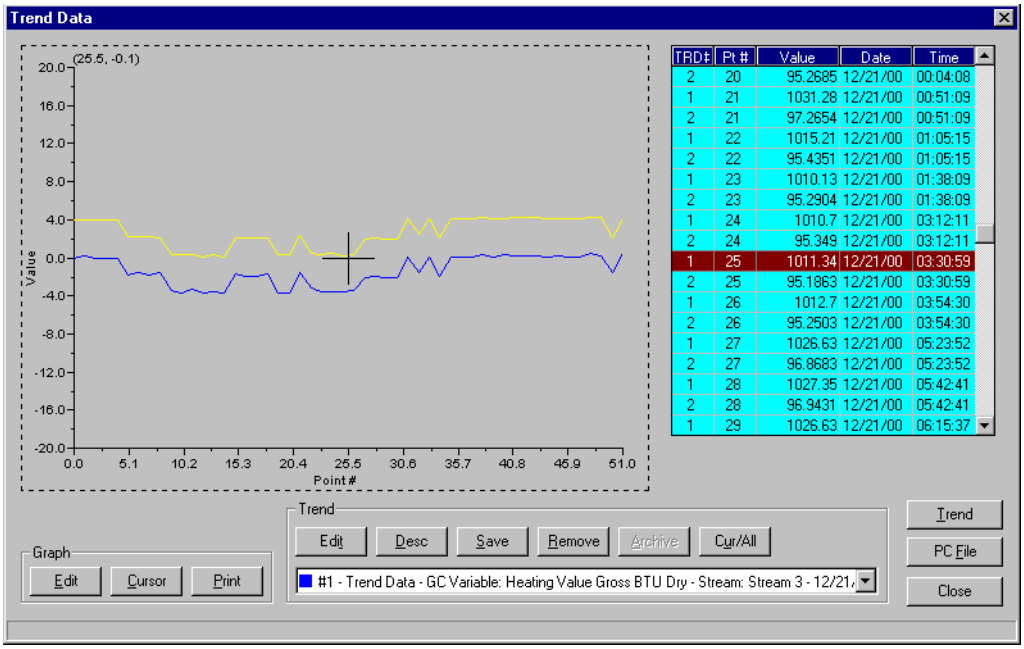
This function allows you to view, print, or save graphical representations, or trend lines, of accumulated analysis data for the 2350A and the Model 700 GC Controllers.

### 7.6.1 Trend Data Model 700/2350A GCs

1. Use the *Reports* > *Trend Data* menu, then click the Trend button to access this function.




2. The Trend Data dialog appears.




Use the enabled Graph and Trend push-buttons to access the Trend Data features. See the following sections for detailed information.

3. Click the Cancel button to return to the main window.

### 7.6.2 View Live Trend Online Model 700/2350A

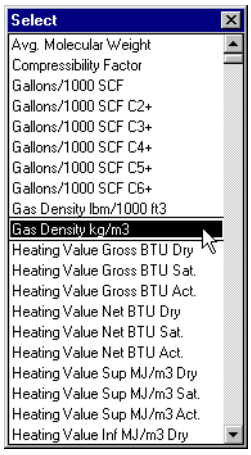
To view a live trend from the online Model 700/2350A GC,

**NOTICE**

**You cannot view a live trend if the corresponding analysis record does not exist in the GC memory.**

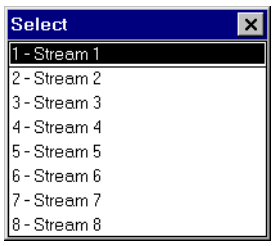
**An error message will display:**

1. Click the Trend button.
2. The Select menu for variable displays.

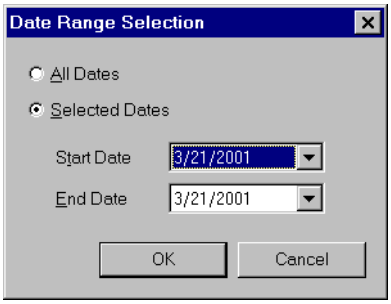



Double-click the desired variable. If the selected variable applies to a single component (e.g., Gallons/1000 SCF, Liquid Volume Percent, or Mole Percent), then the Standard Components menu appears.

3. The Select menu for streams appears. Double-click the left mouse button on the desired stream to make your selection.




4. MON2000 displays the Date Range Selection pop-up dialog.




Select **`All Dates`** radio button or choose **`Selected Dates`**. From the pull-down menu, select the date range for the Trend report.

Click the to apply your selection.


Or,

Click the button to return to the trend window.

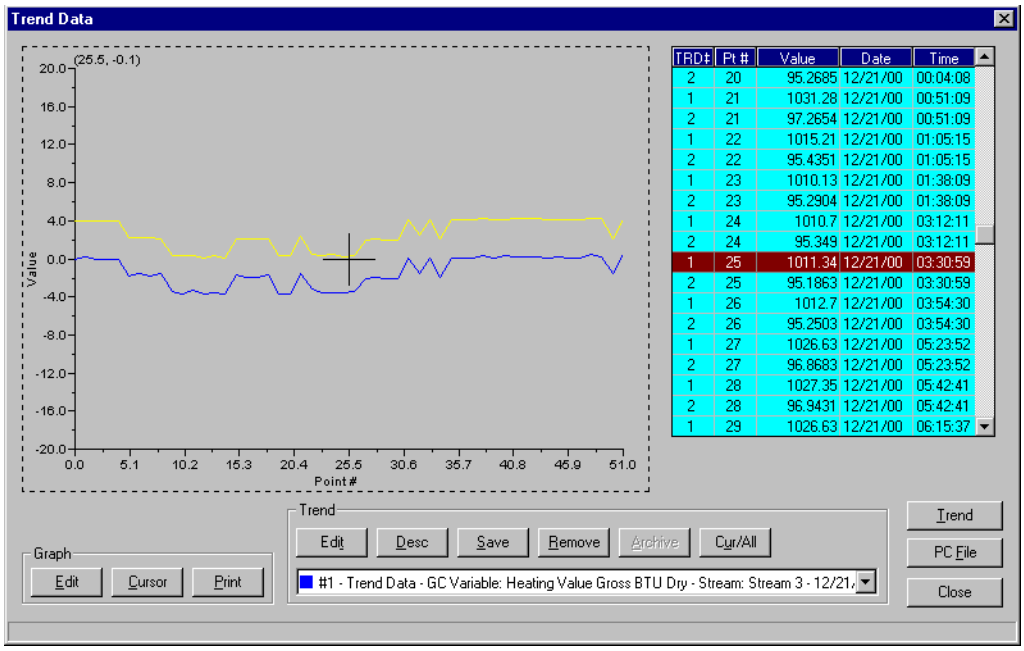

5. MON2000 reads data from the online GC unit and plots the current, live trend for the selected component and stream.

**CAUTION**

**Plotting a trend line interrupts the normal storage of ongoing Auto Sequence analysis results.**

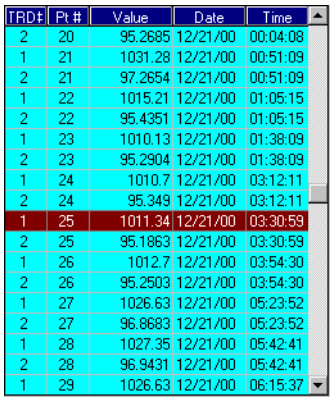
**A trend line graph generated from the maximum 1200 archived analysis records can require up to 8 minutes to plot. Any Auto Sequence analysis that occurs during the plotting will not be retained for future retrieval nor will be included in ongoing calculations.**

The Trend Data window appears.



The corresponding data is dynamically displayed in the provided legend.

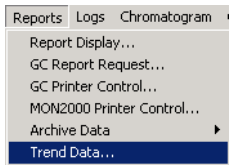
Use the Graph and Trend Options functions to manipulate the display. To zoom in on a particular point, click and drag your mouse over that area; repeat as necessary. Use the Restore State or Zoom Out options from the right-click menu (see Section 7.6.10) to return to the original display.



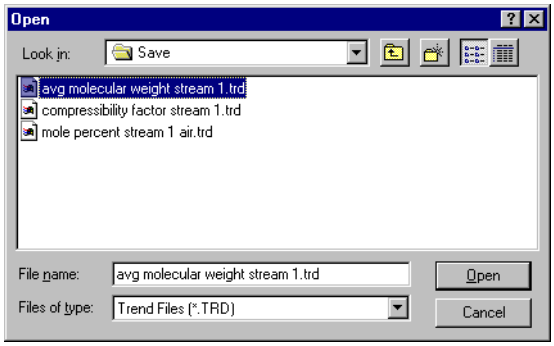
| TRD‡ | Pt # | Value | Date | Time |
|---|---|---|---|---|
| 2 | 20 | 95.2685 | 12/21/00 | 00:04:08 |
| 1 | 21 | 1031.28 | 12/21/00 | 00:51:09 |
| 2 | 21 | 97.2654 | 12/21/00 | 00:51:09 |
| 1 | 22 | 1015.21 | 12/21/00 | 01:05:15 |
| 2 | 22 | 95.4351 | 12/21/00 | 01:05:15 |
| 1 | 23 | 1010.13 | 12/21/00 | 01:38:09 |
| 2 | 23 | 95.2904 | 12/21/00 | 01:38:09 |
| 1 | 24 | 1010.7 | 12/21/00 | 03:12:11 |
| 2 | 24 | 95.349 | 12/21/00 | 03:12:11 |
| 1 | 25 | 1011.34 | 12/21/00 | 03:30:59 |
| 2 | 25 | 95.1863 | 12/21/00 | 03:30:59 |
| 1 | 26 | 1012.7 | 12/21/00 | 03:54:30 |
| 2 | 26 | 95.2503 | 12/21/00 | 03:54:30 |
| 1 | 27 | 1026.63 | 12/21/00 | 05:23:52 |
| 2 | 27 | 96.8683 | 12/21/00 | 05:23:52 |
| 1 | 28 | 1027.35 | 12/21/00 | 05:42:41 |
| 2 | 28 | 96.9431 | 12/21/00 | 05:42:41 |
| 1 | 29 | 1026.63 | 12/21/00 | 06:15:37 |

## 7.6.3 View Trend from File on Disk

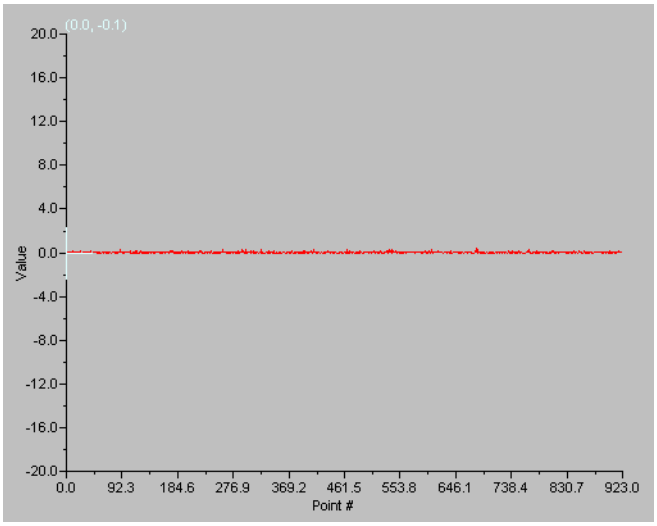
To view a trend from a file previously saved to disk, use the *Reports* > *Trend Data* menu, then click the PC File button to access this function.




1. Click the Open button.
2. Use the provided directory tree to locate the desired TRD file and click the OK button to open.



3. MON2000 displays the trend file.



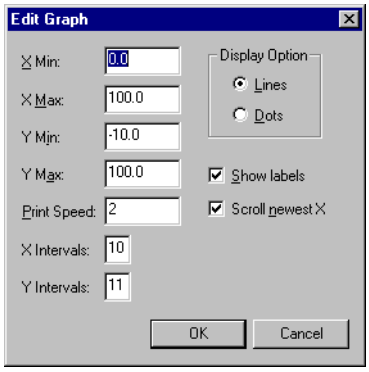

| Pt # | Value | Date | Time |
|---|---|---|---|
| 0 | .0381946 | 9/26/1999 | 1:20:27 AM |
| 1 | .00417453 | 9/26/1999 | 1:24:29 AM |
| 2 | .0123129 | 9/26/1999 | 1:28:32 AM |
| 3 | .00946715 | 9/26/1999 | 1:32:34 AM |
| 4 | .0798518 | 9/26/1999 | 1:36:36 AM |
| 5 | 0 | 9/26/1999 | 1:40:39 AM |
| 6 | .0982002 | 9/26/1999 | 1:44:41 AM |
| 7 | 0 | 9/26/1999 | 1:48:44 AM |
| 8 | .00585657 | 9/26/1999 | 1:52:46 AM |
| 9 | 0 | 9/26/1999 | 1:56:48 AM |
| 10 | 0 | 9/26/1999 | 2:00:51 AM |
| 11 | 0.124345 | 9/26/1999 | 2:04:53 AM |
| 12 | .00557224 | 9/26/1999 | 2:08:56 AM |
| 13 | 0 | 9/26/1999 | 2:12:58 AM |
| 14 | .0510376 | 9/26/1999 | 2:17:00 AM |
| 15 | .0288593 | 9/26/1999 | 2:21:03 AM |
| 16 | 0 | 9/26/1999 | 2:25:05 AM |
| 17 | 0 | 9/26/1999 | 2:29:08 AM |

The corresponding data is dynamically displayed in the provided legend.

Use the Graph and Trend Options functions to manipulate the display. To zoom in on a particular point, click and drag your mouse over that area; repeat as necessary. Use the Restore State or Zoom Out options from the right-click menu (see Section 7.6.10) to return to the original display.

### 7.6.4 Edit Graph Display

1. Click the Edit button. The Edit Graph dialog appears.




2. Use the provided attributes and options to change the trend display as desired.

3. Click the OK button to accept your changes and return to the Trend Data dialog.

   Click the Cancel button to abort and return to the Trend Data dialog.

4. The trend display changes as specified.

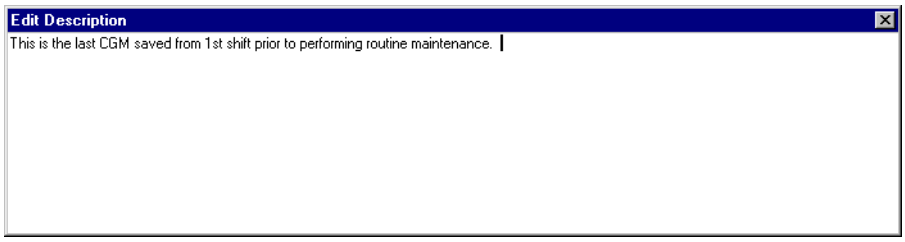
   Additional display options are available by right-clicking the display area. See Section 7.6.10 for more information.

### 7.6.5 Changing Cursor Size

To toggle the cursor size from course movement (less accurate) to fine movement (more accurate), click the Cursor button.

### 7.6.6 Describe Trend

1. Click the Desc button. The Edit Description dialog appears.




2. Type the desired statement(s).
3. Press the ENTER key to save this description.

   Use the ✕ button or press the ESC key to exit this dialog without saving your entry.

### 7.6.7 Print Trend

To print the displayed trend graph, click the Print button.

MON2000 prints the report to your configured printer (see Section 3.7).

### 7.6.8 Save Trend

NOTICE

**The table is saved as a tab-deliminated ASCII file with a .txt extension.**

To save a currently displayed trend to disk,

1. Click the Save button.
2. Use the provided directory tree to select the desired file location and name, then click the Save button.
3. MON2000 saves the trend along with its graph settings.

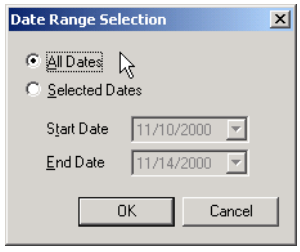
### 7.6.9 Read Trend Archive

This feature is not available if the corresponding analysis record does not exist in the GC memory or if you are viewing this trend data offline from a file.

To read the Trend Archive,

1. Click the Archive button.

   If you are operating a Model 700 or 2350A GC, then an Archive Range Selection dialog displays.

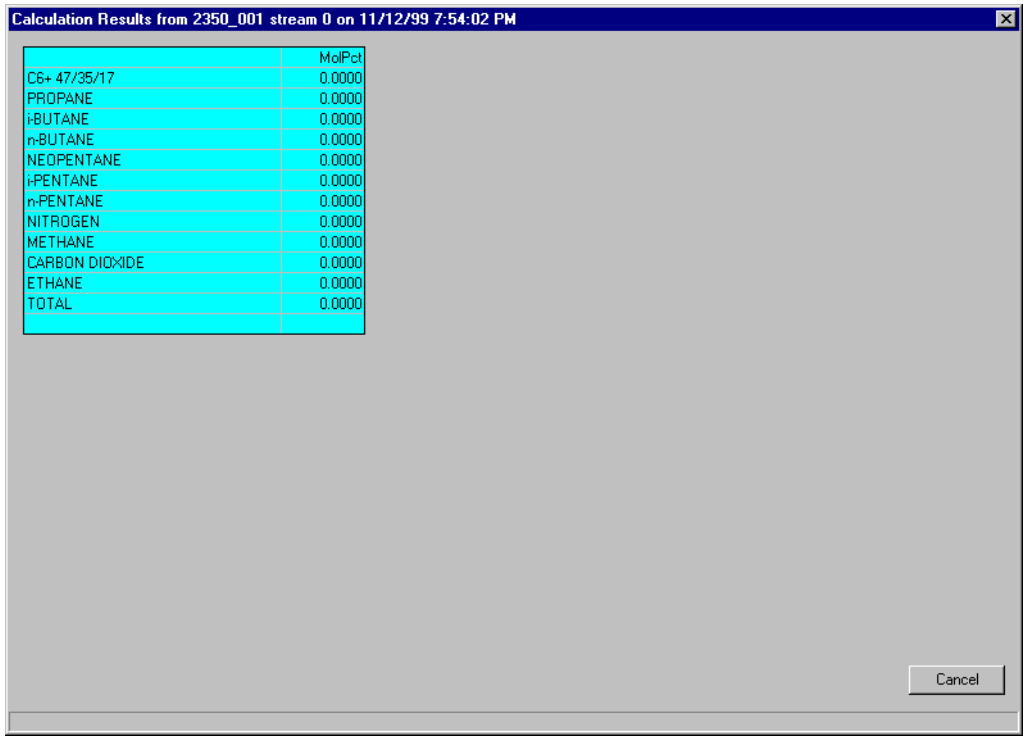
   
   

   (a) Toggle the appropriate radio button to select either *All Dates* or *Selected Dates*.

   To specify a date range, use the *Start Date* and *End Date* pull-down menus.

   (b) Click the OK button to continue.

2. The Archive dialog appears.




3. Click the Cancel button to return to the Trend Data dialog.

### 7.6.10 Display Options

Right-click the graph area to access these options, or use the corresponding keystroke(s). Options are listed in alphabetical order.

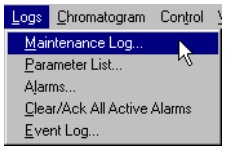
*Table 7-10 Display Options for Trend Data*

| Keystroke | Right-Click Option | Description |
|---|---|---|
| CTRL C | Copy to clipboard | allows you to copy this graph to another application such as MS Word or Excel |
| F8 | Cursor to nearest point | snap cursor to nearest point in both the X and Y directions |
| CTRL V | Paste from clipboard | allows you to plot a range of points from another application such as Meshwork or Excel |
| CTRL P | Print Plot Area | print currently displayed chromatograph area |
| CTRL S | Print Series All | print all displayed chromatograms |
| HOME | Restore State | restore last saved display settings for the selected chromatogram |
| CTRL HOME | Save State | save current display settings for the selected chromatogram |
| F4 | Toggle Coarse/Fine | toggle cursor from coarse (less accurate) to fine (more accurate) |
| F9 | Toggle Lines/Dots | toggle graph from line(s) to dots |
| CTRL F4 | Toggle Mouse Position Tip | graph cursor follows movement of mouse while tooltip displays exact coordinates of the current point |
| CTRL F9 | Toggle Nearest Point Tip | graph cursor follows movement of mouse cursor |
| NUM + | Zoom In | zoom in on entire graph |
| NUM – | Zoom Out | zoom out from entire graph |
| NUM → | Zoom X In | zoom in on X axis |
| NUM ← | Zoom X Out | zoom out from X axis |
| NUM ↑ | Zoom Y In | zoom in on Y axis |
| NUM ↓ | Zoom Y Out | zoom out from Y axis |

# LOGS

The options in the Logs pull-down menu allows you to keep a maintenance record, keep a parameter record, and view the Alarm and Event Logs.

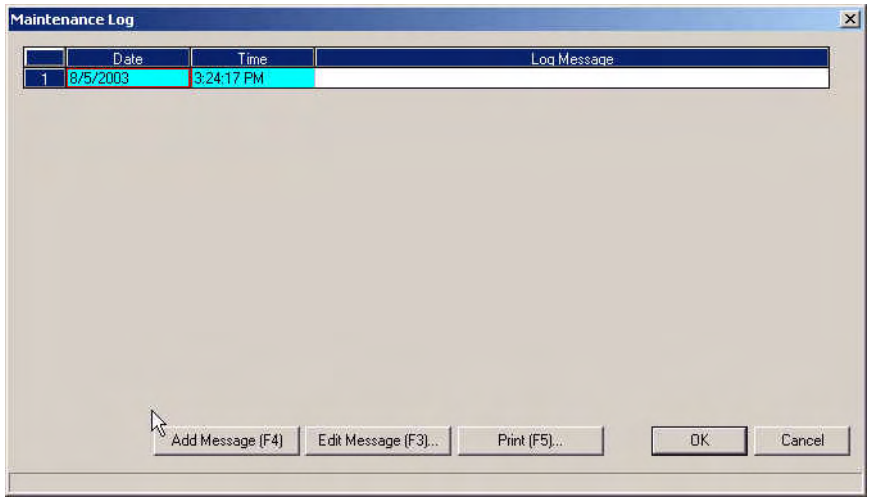
## 8.1 MAINTENANCE LOG




Use this function to track maintenance activities performed on a given GC unit.

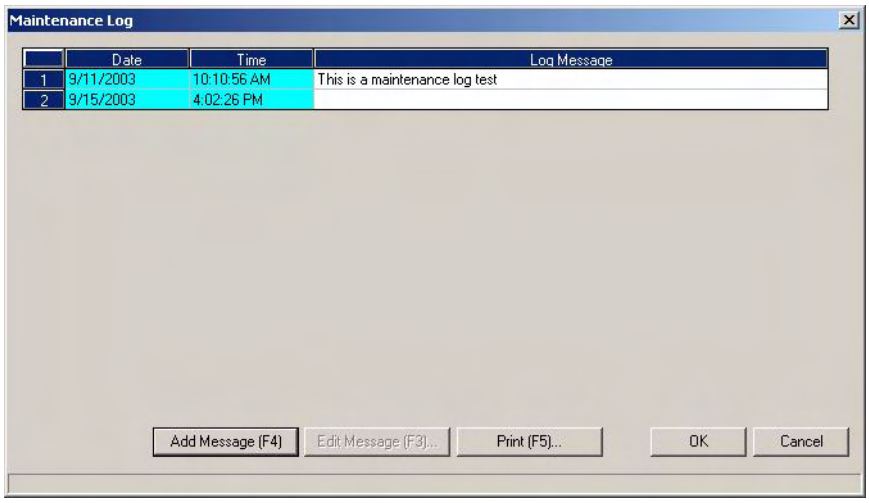
To read and edit the Maintenance Log,

1. Use the *Logs* > *Maintenance Log* menu to access this function. MON2000 retrieves the data from the GC unit.
2. The Maintenance Log dialog appears.



3. To add the log entry text,

   (a) Click the "Add Message F4" button or click the last 'Log Message' cell and press the RETURN key. The Maintenance Log message dialog displays.




   (b) Add text in the appropriate *Log Message* cell, then click the OK button to apply the changes. Click the Cancel button to discard your changes and return to the Main window.

4. To change the log entry text,

   (a) Click the appropriate *Log Message* cell.

   (b) Click the Edit Message (F3)... button. The Edit Log Message dialog appears.

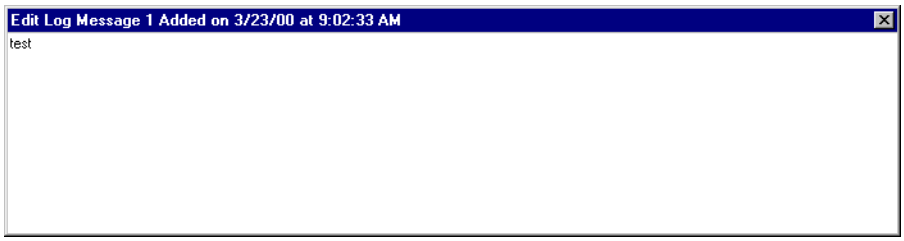
   (c) Type your edits.

**NOTICE**

**A Log Message can contain up to 1000 characters.**

**However, the entire Maintenance Log can contain no more than 1100 characters.**

(d) To accept your edits, press the RETURN key. To cancel your edits, click the ✕ button or press the ESC key.

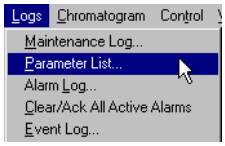



5. To delete a log entry, click the desired log entry and press the DELETE key.

6. Click the OK button to write this data to the GC unit.

   Click the Cancel button to abort and return to the main window.

## 8.2 PARAMETER LIST




Use this function to keep a record of the hardware components and associated parameters for a given GC unit.

To read and edit the Parameter List,

1. Use the *Logs* > *Parameter List* menu to access this function. MON2000 retrieves the data from the GC unit.

2. The Parameter List dialog appears.

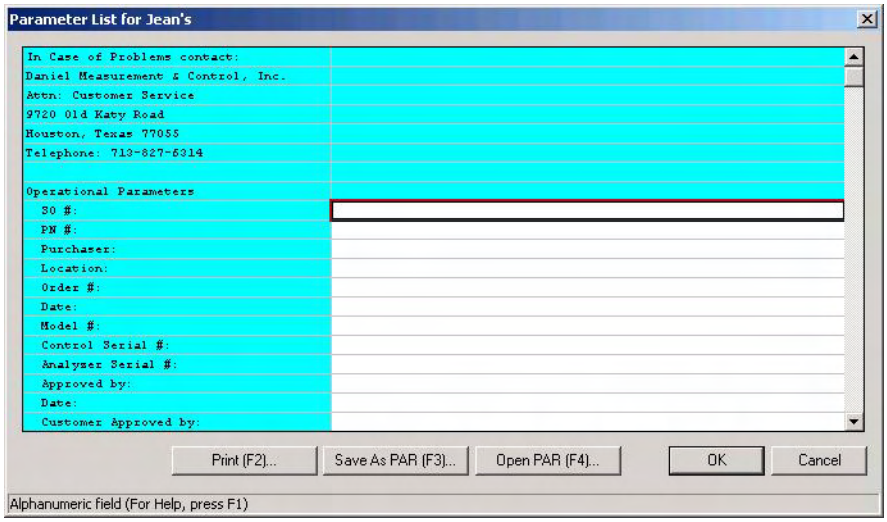


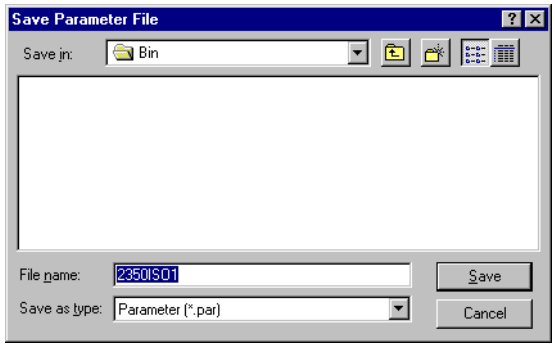

*Table 8-1 Items in Parameter List*

| Type | Parameter |
|---|---|
| Operational | SO #<br>PN #<br>Purchaser<br>Location<br>Order #<br>Date<br>Model #<br>Control Serial #<br>Analyzer Serial #<br>Approved by<br>Date<br>Customer Approved by<br>Date |
| Drawings | Analyzer Flow<br>Sample Conditioning System<br>Interconnect Wiring<br>Outline and Dimensional<br>System Wiring<br>Other |

*Table 8-1 Items in Parameter List (Continued)*

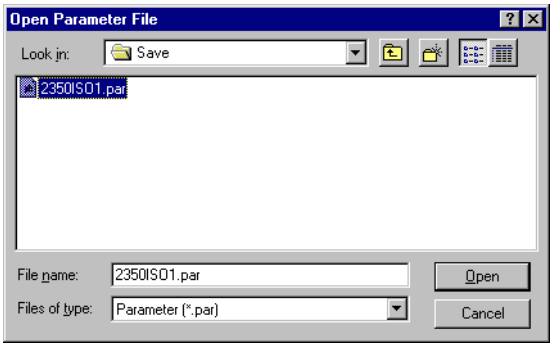
| Type | Parameter |
|---|---|
| Analysis | Settings<br>Flows in cc/min<br>Sample Loop 1<br>Sample Loop 2<br>Detector<br>Valve Part Numbers |
| Sample System | Sample Valve 1 Flow Rate (cc/min)<br>Sample 1 Pressure (PSIG)<br>Sample Valve 2 Flow Rate (cc/min)<br>Sample 2 Pressure (PSIG)<br>SCS Oven Temperature (°C)<br>Solenoid Purge Flow (cc/min/stream) |
| Column | OD (in.)<br>ID (in.)<br>Length<br>Support<br>Mesh<br>Phase<br>Connected<br>Function |

3. To save this data to disk, click the Save As PAR (F3)... button or press the F3 key. The Save Parameter File dialog appears.



This feature only saves the files in .par format. Use the Save Parameter File dialog to choose the directory location and file name.

4. To open an existing parameter file from disk, click the Open PAR (F4)... button or press the F4 key.



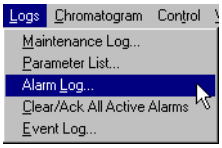

Use the Open Parameter File dialog to choose the desired file.

5. Click the OK button to write your changes to the GC unit.

   Click the Cancel button to abort and return to the main window.

## 8.3 ALARM LOG

Use this function to read and/or clear the various entries in the Alarm Log. The Alarm Log is a circular buffer that contains 50 entries.




To clear or acknowledge all active alarms, see Section 8.4.

To view the Alarm Log,

1. Use the *Logs* > *Alarm Log* menu to access this function. MON2000 retrieves the last 50 alarms from the GC unit.
2. The Alarm Log dialog appears.

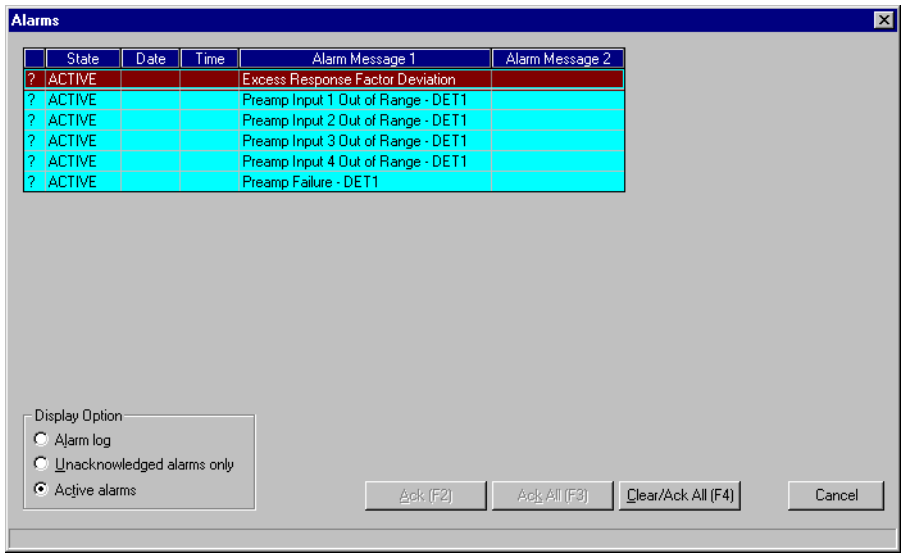

Alarms
State
Date
Time
Alarm Message 1
Alarm Message 2
? ACTIVE Excess Response Factor Deviation
? ACTIVE Preamp Input 1 Out of Range - DET1
? ACTIVE Preamp Input 2 Out of Range - DET1
? ACTIVE Preamp Input 3 Out of Range - DET1
? ACTIVE Preamp Input 4 Out of Range - DET1
? ACTIVE Preamp Failure - DET1
Display Option
Alarm log
Unacknowledged alarms only
Active alarms
Ack (F2)
Ack All (F3)
Clear/Ack All (F4)
Cancel

*Table 8-2 Alarm Log Attributes*

| Attribute | Description |
|---|---|
| <acknowledgement> | indicates whether the alarm has been acknowledge<br><br>U = unacknowledged<br>? = status unknown |
| State | indicates whether the alarm is currently active<br><br>SET = currently active<br>CLEAR = inactive |
| Date/Time | date and time the alarm condition began |

*Table 8-2 Alarm Log Attributes (Continued)*

| Attribute | Description |
|---|---|
| Alarm Message 1 | describes the alarm condition |

**CAUTION**

**If an alarm message is changed (see Section 5.6 and Section 5.7) all affected alarm entries, including those previously recorded, will include that change.**

| | |
|---|---|
| Alarm Message 2 | displays the alarm limit and current condition values, as applicable |

3. By default, MON2000 displays all recorded alarms.

   To view only the unacknowledged alarms, click the *Unacknowledged alarms only* radio button.

   To view only the active alarms, click the *Active alarms* radio button.

4. To acknowledge a single alarm,

**CAUTION**

**An alarm triggered by a user-defined value will continue to display as an active alarm until that value is no longer in the alarm state.**

   (a) Ensure you have selected the correct display option (see Step 3).

   (b) Select the alarm you want to acknowledge.

   (c) Click the Ack (F2) button or press the F2 key.

5. To acknowledge all unacknowledged alarms,

   (a) Ensure you have selected the correct display option (see Step 3).

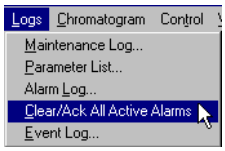
   (b) Click the Ack All (F3) button or press the F3 key.

   In the Active Alarm view, click the Clear/Ack All (F4) button or press the F4 key.

   If an alarm is cleared before the condition has been resolved, MON2000 redisplays the alarm entry as an active alarm.

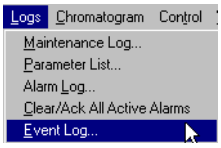
6. Click the Cancel button to exit and return to the main window.

## 8.4 CLEAR OR ACKNOWLEDGE ACTIVE ALARMS




To clear or acknowledge all alarms, click the Logs pull-down menu and select the *Clear/Ack All Active Alarms* option.

## 8.5 EVENT LOG




Use this function to track the system and operator events that have occurred with a given GC unit.

To view the Event Log,

1. Use the *Logs* > *Event Log* menu to access this function. MON2000 retrieves the last 50 events from the GC unit.

2. The Event Log dialog appears, displaying each system or operator event and the corresponding data.

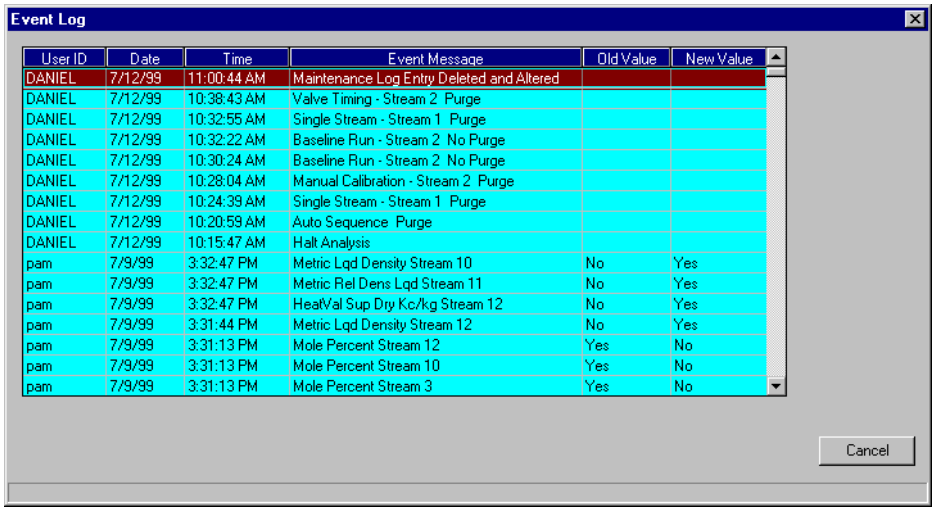

Event Log
User ID
Date
Time
Event Message
Old Value
New Value
DANIEL 7/12/99 11:00:44 AM Maintenance Log Entry Deleted and Altered
DANIEL 7/12/99 10:38:43 AM Valve Timing - Stream 2 Purge
DANIEL 7/12/99 10:32:55 AM Single Stream - Stream 1 Purge
DANIEL 7/12/99 10:32:22 AM Baseline Run - Stream 2 No Purge
DANIEL 7/12/99 10:30:24 AM Baseline Run - Stream 2 No Purge
DANIEL 7/12/99 10:28:04 AM Manual Calibration - Stream 2 Purge
DANIEL 7/12/99 10:24:39 AM Single Stream - Stream 1 Purge
DANIEL 7/12/99 10:20:59 AM Auto Sequence Purge
DANIEL 7/12/99 10:15:47 AM Halt Analysis
pam 7/9/99 3:32:47 PM Metric Lqd Density Stream 10 No Yes
pam 7/9/99 3:32:47 PM Metric Rel Dens Lqd Stream 11 No Yes
pam 7/9/99 3:32:47 PM HeatVal Sup Dry Kc/kg Stream 12 No Yes
pam 7/9/99 3:31:44 PM Metric Lqd Density Stream 12 No Yes
pam 7/9/99 3:31:13 PM Mole Percent Stream 12 Yes No
pam 7/9/99 3:31:13 PM Mole Percent Stream 10 Yes No
pam 7/9/99 3:31:13 PM Mole Percent Stream 3 Yes No
Cancel

*Table 8-3 Event Log Attributes*

| Attribute | Description |
|---|---|
| User Id | user name |
| Date | date event occurred |
| Time | time event occurred |
| Event Message | indicates event type (i.e., describes event) |
| Old Value | if applicable, the value before the event |
| New Value | if applicable, the value after the event |

3. Click the Cancel button to exit and return to the main window.

# MON2000 PLUS DATA COLLECTION/AUTO-POLLING

**NOTICE**

**The Data Collection feature is only available with the MON2000 PLUS program.**

## 9.1 OVERVIEW

The MON2000 PLUS program provides configurable automatic collection and storage of analysis and calibration data from the gas chromatograph controller.

Configuration of the specific chromatographs to be polled, timing of polling, and specific data to be collected from each is defined by the user through the setup of polling control files.

An Auto-Sequencing module interprets the commands in a polling control file and performs the collection and storage of data

Data collected is stored in text files (.txt) or comma delimited files (.csv). The emphasis is on the data being in a form suitable for import by standard spreadsheet and/or database programs.

**CAUTION**

**The MON2000 PLUS program is not designed to provide database capability for the data collected.**

Reports collected are stored in text files (.txt) formatted as ready-to-print or in comma-delimited files (.csv) that reduce white space and the output file size.

### GC Controller Model Support

All Model 500 and Model 700 GC controllers are supported in the acquisition of the following types of data:

Modbus Register - Both User Modbus and SIM2251 single and multiple register queries will be supported.

Averages - Direct Access to single averages and/or blocks of averages includes support for acquiring results from most recent averaging period as well as those for previous averaging periods (number limited by number supported by specific model and application). Access to average value, maximum value, minimum value, and number of samples for the period to be supported.

Alarms - Selection of Alarm Log, Active Alarms, or Unacknowledged Alarms.

Event Log - Selection of complete Log or events since last collection

Reports - Archive data accessible via *Reports>Archive Data>View Data* menu are available (selection based on most recent number of days, date range, single stream or all streams). Selections are based on the various GC model and are consistent with the capabilities of those models and specific applications.

Maintenance Log - Selection of entire log, date range, and most recent number of days.

Access to the following data is dependent on support of the specific GC (2350A GC Controller, and Model 700) and the applications downloaded:

- Calibration - Access to special structures containing calibration data for the most recent calibration sequences, date range, single or all streams. Data is included for each of the individual calibration runs included in the averages and the final calibration report.

## 9.2 DATA COLLECTION CONFIGURATION

### Polling Control Files

A polling control file contains commands to be executed in order to acquire desired sets of data from one or more gas chromatographs.

Use MON2000 PLUS program to create and edit polling control files. A Save function allows cloning of existing polling control files.

This function is performed in the Online or Offline mode.

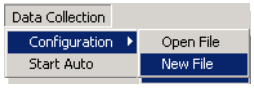
### Polling Control Commands

Choose a desired command from the list of available commands and input the necessary data to complete the command. The completed command is added to the file, and continues with the next desired command. This process is continued until all commands are selected and configured for the file. Edit the polling control file by adding, deleting, and inserting commands.

*Table 9-1 Auto Polling Control Commands*

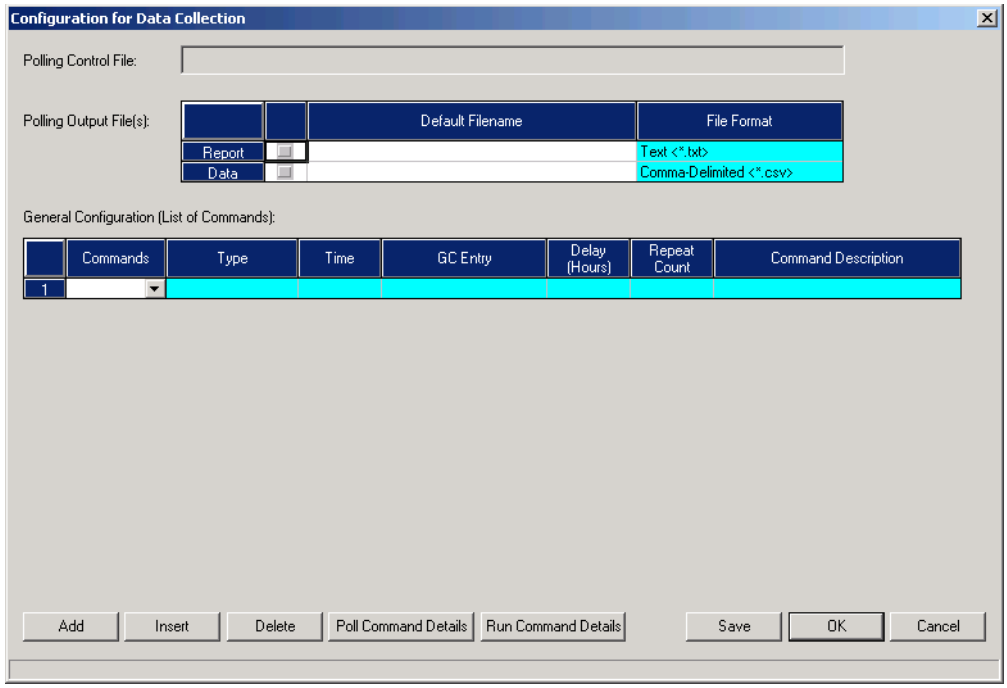
| Polling Control Command | Description |
|---|---|
| Await | This command instructs the Auto-Sequencing module to await a specific time of day prior to continuing processing the commands in this file. The user enters the desired time of day in hours and minutes. |
| Connect | The connect command instructs the Auto-Sequencing module to establish communications with the indicated GC Controller using the communication method and parameters as indicated in the GC directory entry. After selection of the Connect command the user selects the desired GC Controller from a list of the GC directory entries. |
| Delay | The delay command instructs the Auto-Sequencing module to delay for a specified interval of time prior to proceeding. The user enters the time in hours. |
| Disconnect | This command instructs the Auto-Sequencing module to terminate communications with the controller to which it is currently connected. No additional user provided information is necessary for this command. If this command is executed and no GC Controller is connected, then the command is ignored. |
| End | This command marks the end of the polling control file and signals the Auto-Sequencing module to stop processing. |
| Poll | The poll command instructs the Auto-Sequencing module to acquire a set of data of a single type from the GC Controller to which it is currently connected. The user first selects the data type to be acquired.<br><br>Poll Data Types<br>• Alarms<br>• Averages<br>• Calibration<br>• Event Log<br>• Registers<br>• Reports<br>• Maintenance Log |
| Repeat | The repeat command instructs the Auto-Sequencing module to restart processing of the commands in the polling control file at the beginning of the file. The repeat command can be specified with a count that specifies the number of times to execute the sequence of commands in the file. Without the count (or with a count of zero) the sequence of commands will be re-executed indefinitely until terminated manually by the user. |
| Run | The run command instructs the Auto-Sequencing module to start execution of a user program. The user specifies whether the Auto-Sequencing module waits for completion of the user program before processing the poll control file commands, or continues immediately thus executing in parallel with the user program. This feature allows you to further process the collected data. As an example, the user program might perform some validity checking on the data, reformat it, and then and store it in an Access database on the MON2000 PLUS PC. |

## Create a New Polling Control File

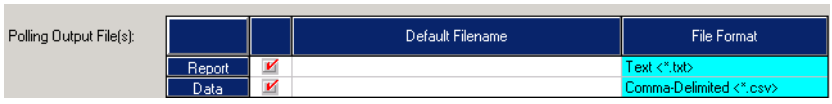



To create and configure a new polling control file,

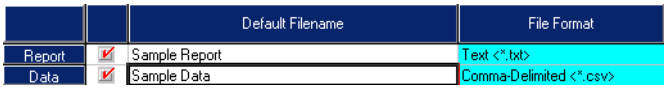
1. Use the *Data Collection > Configuration>New File* menu to access this function.
2. MON2000 PLUS displays the Configuration for Data Collection window.




3. Select the desired command from the Polling Output File(s) (Report and/or Data) by clicking the appropriate check box.



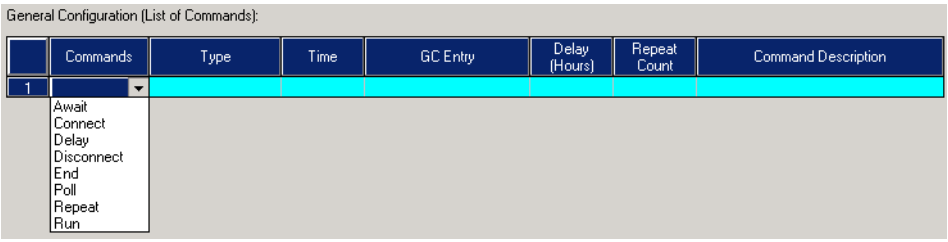
Use the tab key to select the Default file name field, then assign a name for the chosen selection(s).




**NOTICE**

**Each Poll Command includes the criteria to define acquisition and storage of a single type of data.**

4. Click the **`Poll Commands`** pull-down menu from the General Configuration (Lists of Commands) section of the Configuration for Data Collection Window.

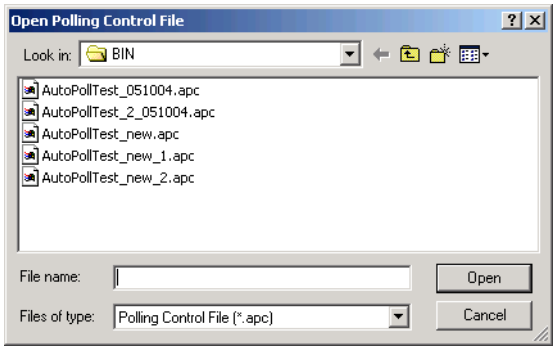



### Edit An Existing Polling Control File

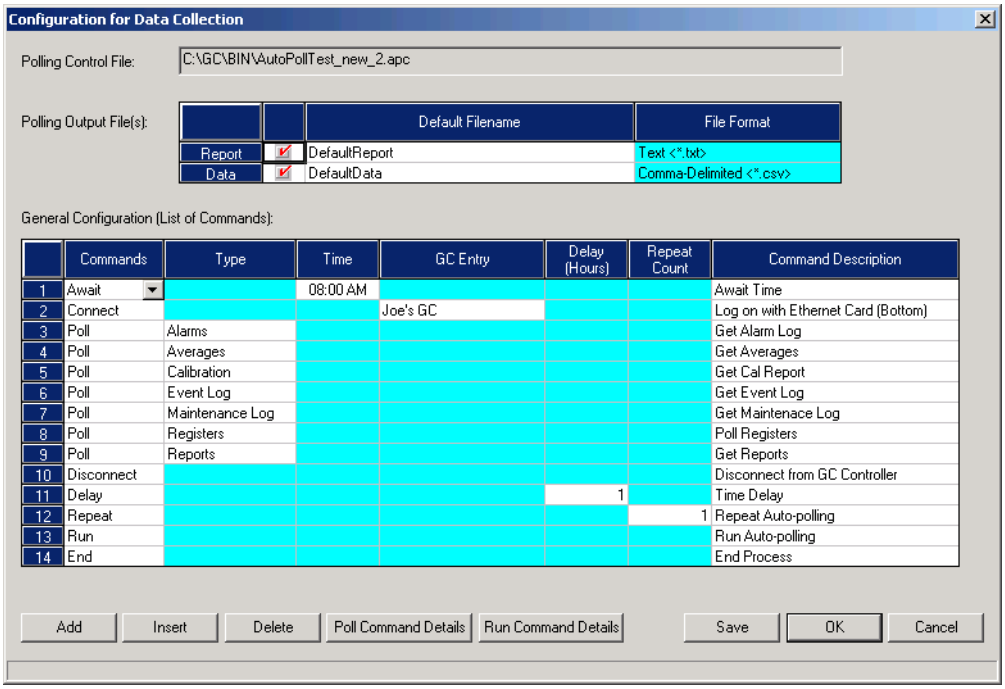
To edit or modify the configuration of an existing file,

1. From the MON2000 main window, use the *Data Collection>Open File* menu.

2. Click the Open button and the Open Polling Control File window displays.

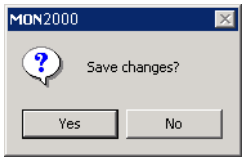


3. Select the desired polling control file, then click the Open button.
4. The Configuration for Data Collection window displays.




5. Use the Add Insert Delete buttons to modify the Data Collection configuration file.
6. When you have finished modifying the file, click the Save button to apply the changes. You may rename the Polling Control file (*.apc) or write over the existing file.
7. You are returned to the Configuration for Data Collection window. Click the OK button.

8. MON2000 PLUS displays the Save Changes dialog.




9. Click the Yes button to save the changes and return to the Configuration for Data Collection window.

   Or,

   Click the No button to discard your changes.

### Connect Command

To configure the Connect Command,

1. Select **Connect** from the General Configuration Command pull-down menu. Use the communication method and parameters as previously configured in the *File>GC Directory* entry.

**NOTICE**

**Use the communication method and parameters as configured in the File > GC Directory entry.**

2. Enter the **GC Entry Type** and a name for the **Command Description.**
3. Next, click the Add button to select another command.

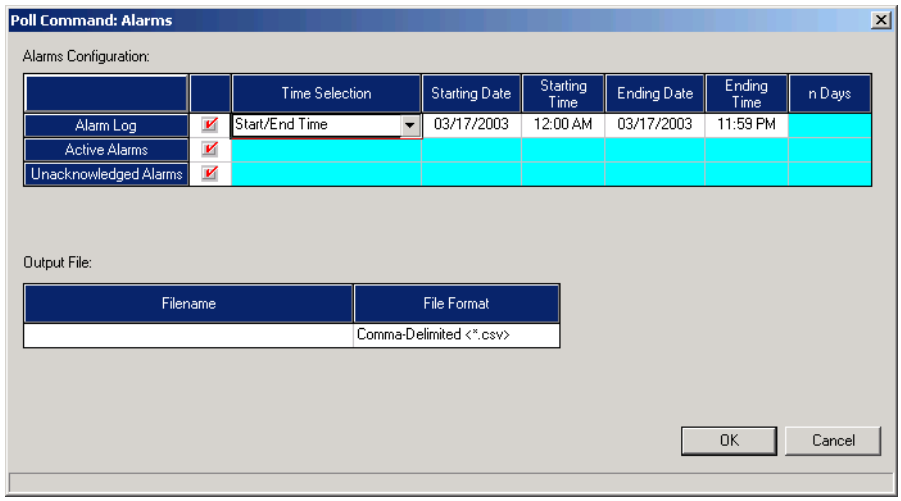
   Or,

   Click the Cancel button at any time during this process to discard any changes and return to the MON2000 PLUS main window.

### Alarms Command

To configure the Alarms Command, from the Configuration for Data Collection window,

1. Select **POLL** from the General Configuration Command pull-down menu.
2. Press the TAB key, or click in the **Type** field and select Alarms from the pull-down menu.
3. In the **Command Description** field, enter a name for the Alarm Log collection.
4. Click the Poll Command Details button. The Poll Command: Alarms dialog box displays.

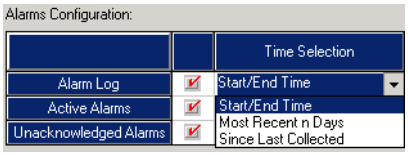



5. Click the Alarm Log check box. Press the TAB key or click in the **Time Selection** field.

6. Use the Time Selection pull-down menu and choose one of the following:
   - Start/End Time
   - Most Recent
   - Since Last Collected

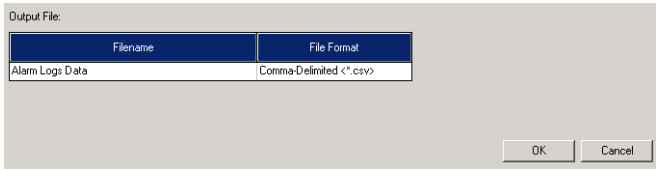
   **NOTICE**

   **Since you are configuring a new polling command file, use either Start/End Time or Most Recent nDays.**




   Enter the starting date, starting time, ending time and ending date in the appropriate data fields.

7. From the Output Field dialog, enter a file name for the Alarms configuration file.




8. Click the OK button to apply the configuration changes.

   MON2000 PLUS displays the Save Changes dialog.

**NOTICE**

**If Active Alarms or Unacknowledged Alarms is selected, no additional information is necessary and all of the entries of the selected type are returned.**

9. Click the Yes button to save the changes and return to the Configuration for Data Collection window.

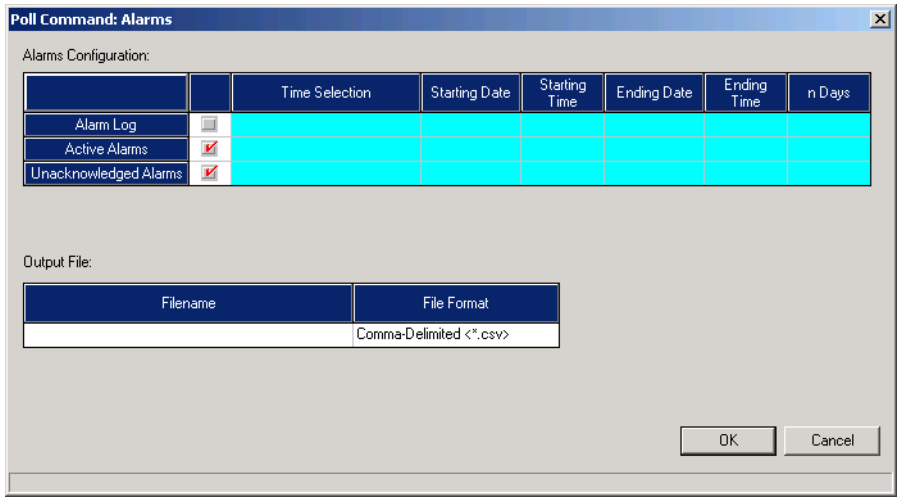
   Or,

   Click the No button to discard your changes.

10. If Active Alarms or Unacknowledged Alarms is selected, no additional information is necessary and all of the entries of the selected type are returned.

    (a) To verify the default settings, from the Configuration for Data Collection Window, click the Poll Command Details button.

    (b) The Poll Command: Alarms dialog box displays.




    (c) The Active Alarms and Unacknowledged Alarm check box are selected.

    (d) Click the OK button to return to the Configuration for Data Collection window.

Add the next poll command for the data collection configuration file by pressing the ENTER key or by clicking the Add button.

### Averages Command

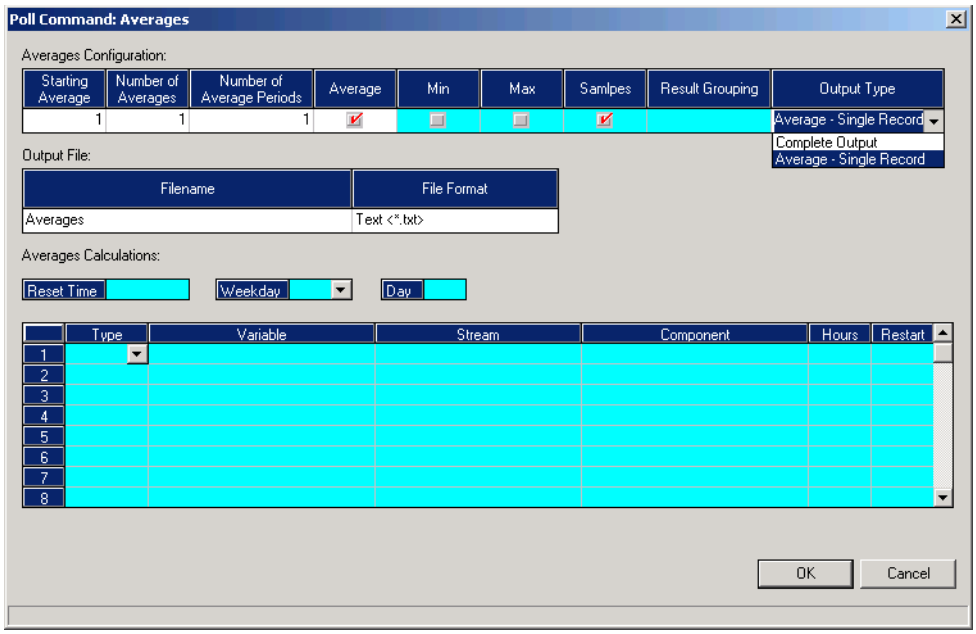
To configure the Averages Command, to acquire sets of one or more averages for the most recent averaging period and/or the previous averaging period (any available in the GC Controller) or select either the Complete Output or Average - Single Record,

**NOTICE**

**MON2000 PLUS reads all of the averages data previously stored. If you are using a direct connection (rather than an Ethernet connection) the averaging data collection can take a long time.**

1. From the Configuration for Data Collection window, select the Polling Output File(s) Type (e.g., Report - .txt or Data - .csv format) and name the report in the Default file name field.
2. Select the **Poll** command.
3. Press the TAB key or click in the **Type** field, then select **Averages** from the pull-down menu.
4. Press the TAB key or click in the **Command Description** field. Assign a name for the Averages data file.

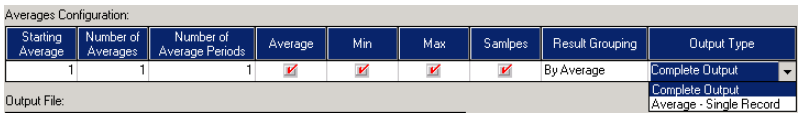
5. Click the Poll Command Details button and the Poll Command: Averages dialog box displays.




6. From the Averages Configuration dialog, for a single record, select Average - Single Record. If the **`Average - Single Record`** is selected, only the average values are included in the output file.

Or,

Select Complete Output. Enter a number for the Starting Average, Number of Averages, Number of Average Periods. Click the check box for Average, Min, Max, and Samples values.




**NOTICE**

**All averages referenced by a single Poll command must be for the same averaging interval (e.g. hourly, daily, weekly, monthly, variable).**

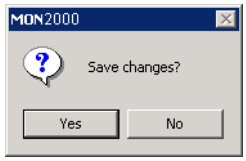
7. Use the Result Grouping pull-down menu and select **By Period** or **By Average**.

   If the number of averages is greater than one, then select whether the results are to be grouped by average, or grouped by period.

   When grouped by Period, the data from all of the periods of a given average are stored in a single record in the output file with the appropriate time-stamp included with the data for each period.

   When grouped by Average, a record for each period contains the values from each of the averages for that period and a single time stamp value is included in the record.

8. Click the OK button to apply the configuration changes.
9. MON2000 PLUS displays the Save Changes dialog.




10. Click the Yes button to write the changes and return to the Configuration for Data Collection window.

    Or,

    Click the No button to discard your changes.

**NOTICE**

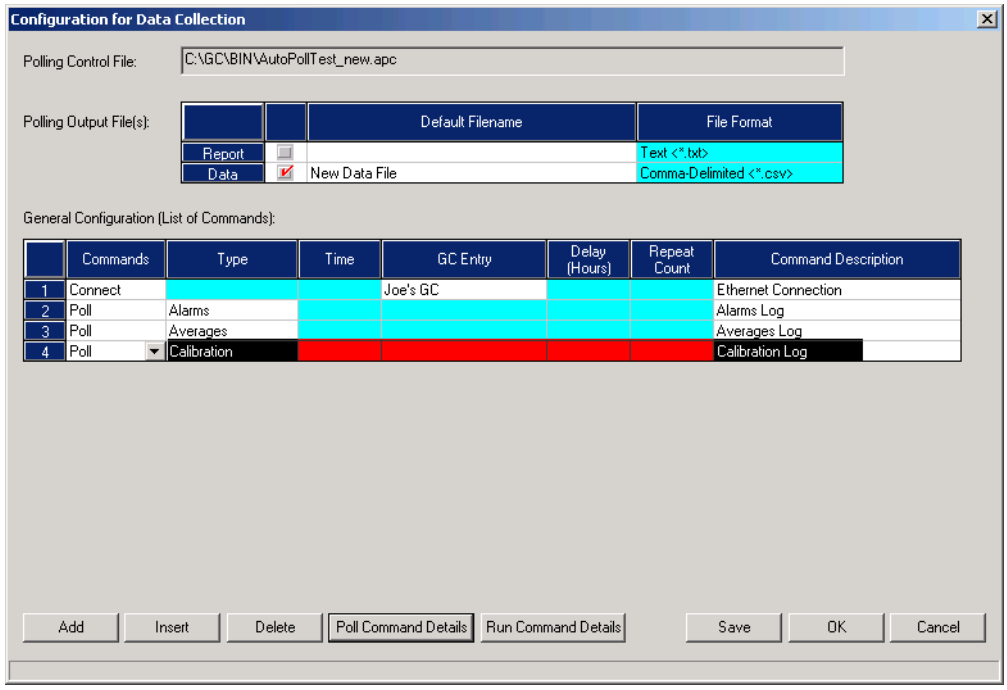
**The values from the Component Data Table are stored whether or not they were updated by the completed calibration.**

### Calibration Command

Releases to date of the 2350A GC, only maintain the response factor data for each component following the completion of each calibration.

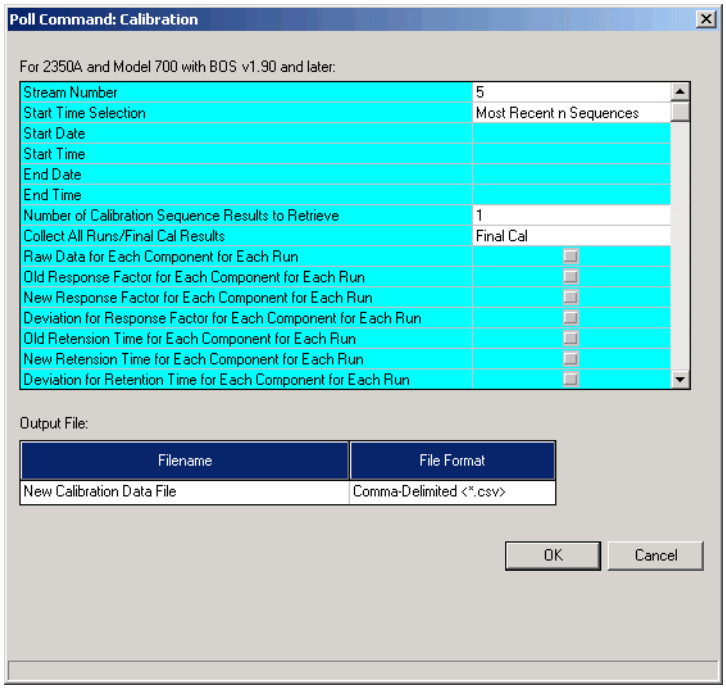
To configure the Calibration Command, for the 2350A GC Controller,

1. From the Configuration for Data Collection window, select the **`Poll`** command.




2. Press the TAB key or click in the **Type** field, then select **`Calibration`** from the pull-down menu.
3. Press the TAB key or click in the **`Command Description`** field. Assign a name for the Calibration data file.

4. Click the Poll Command Details button and the Poll Command: Calibration dialog box displays.


Poll Command: Calibration
For 2350A and Model 700 with BOS v1.90 and later:
Stream Number
5
Start Time Selection
Most Recent n Sequences
Start Date
Start Time
End Date
End Time
Number of Calibration Sequence Results to Retrieve
1
Collect All Runs/Final Cal Results
Final Cal
Raw Data for Each Component for Each Run
Old Response Factor for Each Component for Each Run
New Response Factor for Each Component for Each Run
Deviation for Response Factor for Each Component for Each Run
Old Retension Time for Each Component for Each Run
New Retension Time for Each Component for Each Run
Deviation for Retention Time for Each Component for Each Run
Output File:
Filename
File Format
New Calibration Data File
Comma-Delimited <*.csv>
OK
Cancel

5. Specify the number of calibrations for which the response factor results are desired.

   If you specify a number of calibrations, then the most recent number of calibration results are included in the output file (with one record for each calibration).

**NOTICE**

**Calibration archiving for a future release of the Model 2350A and the Model 700 will be modified to store the results of at least the most recent year of calibrations.**

6. When configuring the Calibration Poll Command for 2350A or Model 700, select the following criteria:

   - Stream number
   - Starting date/time and Ending data/ time, since last collected, or most recent n sequences
   - Number of calibration sequence results to retrieve
   - Collect all runs or just final cal results
   - Specific parameters desired
   - Data only or report format

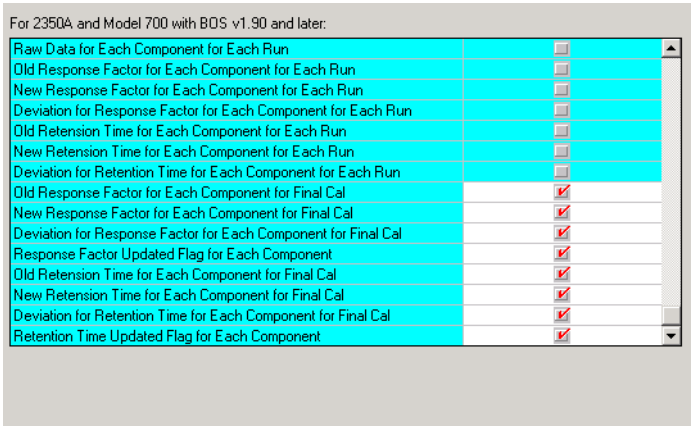
   Records included in the output file (with one record for each calibration are:

   **NOTICE**

   **Calibration archiving for a future release of the Model 500 and the Model 700 will be modified to store the results of at least the most recent year of calibrations.**

   - Stream
   - Cycle Start time
   - GC identifier
   - Response factors for each component in the Component Data Table following the final calibration.

For each calibration sequence, the data for the individual calibration runs (which were used to develop the Final Calibration results) are included as follows:

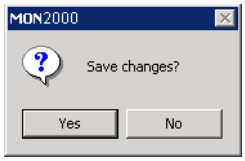

For 2350A and Model 700 with BOS v1.90 and later:
Raw Data for Each Component for Each Run
Old Response Factor for Each Component for Each Run
New Response Factor for Each Component for Each Run
Deviation for Response Factor for Each Component for Each Run
Old Retension Time for Each Component for Each Run
New Retension Time for Each Component for Each Run
Deviation for Retention Time for Each Component for Each Run
Old Response Factor for Each Component for Final Cal
New Response Factor for Each Component for Final Cal
Deviation for Response Factor for Each Component for Final Cal
Response Factor Updated Flag for Each Component
Old Retension Time for Each Component for Final Cal
New Retension Time for Each Component for Final Cal
Deviation for Retention Time for Each Component for Final Cal
Retention Time Updated Flag for Each Component

- Run number
- Cycle start time
- Raw data for each component
- Old response factor for each component
- New response factor for each component
- Deviation for response factor for each component
- Old retention time for each component
- New retention time for each component
- Deviation for retention time for each component

Additionally the Final Calibration Reports results will be included as follows:

- Cycle start time of last run in sequence
- Old response factor for each component
- New response factor for each component
- Deviation for response factor for each component
- Response factor updated flag for each component
- Old retention time for each component
- New retention time for each component
- Deviation for retention time for each component
- Retention time updated flag for each component
- Dry gross BTU

7. Click the OK button to apply the configuration changes.
8. MON2000 PLUS displays the Save Changes dialog.




9. Click the Yes button to write the changes and return to the Configuration for Data Collection window.

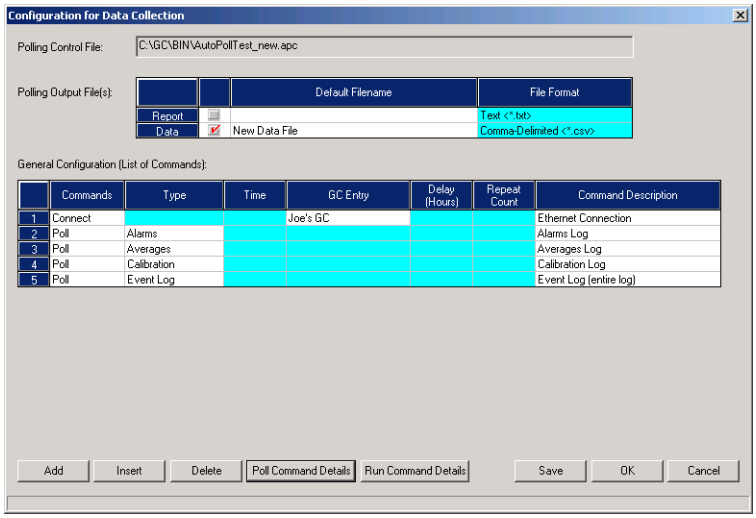
   Or,

   Click the No button to discard your changes.

   MON2000 PLUS returns you to the Configuration for Data Collection window.

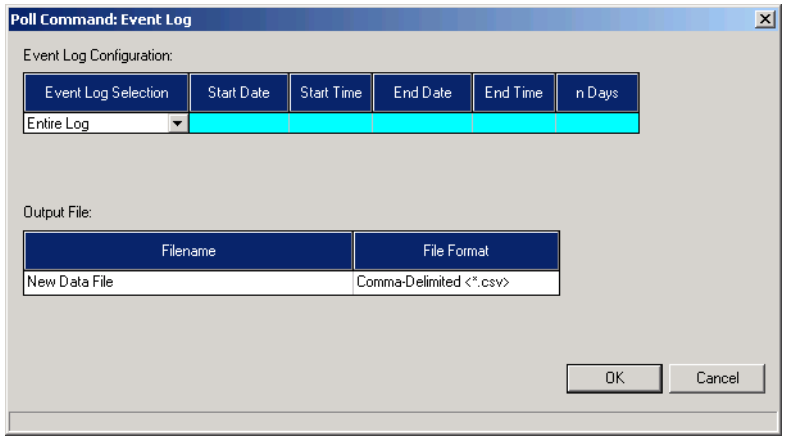
### Event Log Command

1. From the Configuration for Data Collection window, click the Add button to select another command.




2. Next, select the **`Poll`** command
3. Press the TAB key or click in the **`Type`** field, then select **`Event Log`** from the pull-down menu.
4. Press the TAB key or click in the **`Command Description`** field. Assign a name for the Event Log data file.

5. Click the Poll Command Details button and the Poll Command: Event Log dialog box displays.




6. From the Event Log Selection pull-down menu, choose **`Entire Log`**.

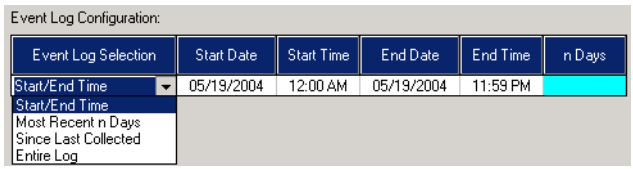
7. Click the OK button to apply the configuration changes.

   MON2000 PLUS returns you to the Configuration for Data Collection window.

For each entry in the event log which satisfies the selection criteria a record containing the following information is stored:

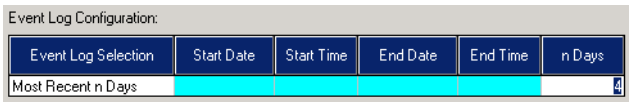
- User ID of user initiating the change (or SYSTEM)
- Date/time of occurrence
- Description of the event
- Parameter value prior to the event (old value)
- Parameter value after the event (new value)

8. From the Event Log Selection, use the pull-down menu and choose **`Start/End Time`**.




MON2000 PLUS automatically inserts the current date and a default start and end date in the appropriate fields. You make edit these fields for your configuration preferences by double-clicking in each field and using the up and down arrows to change the settings.

Another Event configurations is **`Most Recent nDays`**.

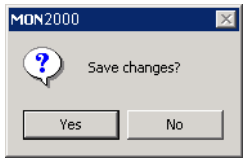



Select the number of days to be polled in the **`nDays`** field.

**NOTICE**

**Since you are configuring the data to be collected for a new file, the Since Last Collected command is not applicable. Use this command after you have established archive data files.**

9. Click the OK button to apply the configuration changes.
10. MON2000 PLUS displays the Save Changes dialog.




11. Click the Yes button to write the changes and return to the Configuration for Data Collection window.

    Or,

    Click the No button to discard your changes and return to the Configuration for Data Collection window.

### Registers Command

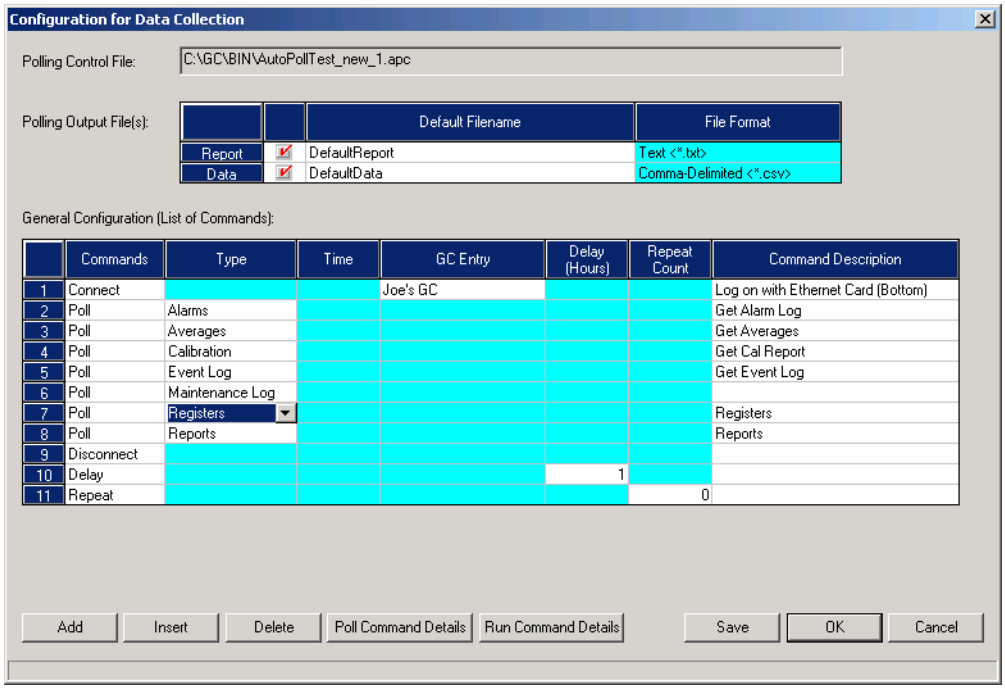
**NOTICE**

**MON2000 PLUS reads all of the stored Modbus Registers. If you are using a direct connection (rather than an Ethernet connection) the data collection process can take a long time.**

Blocks of modbus register data can be specified for collection.

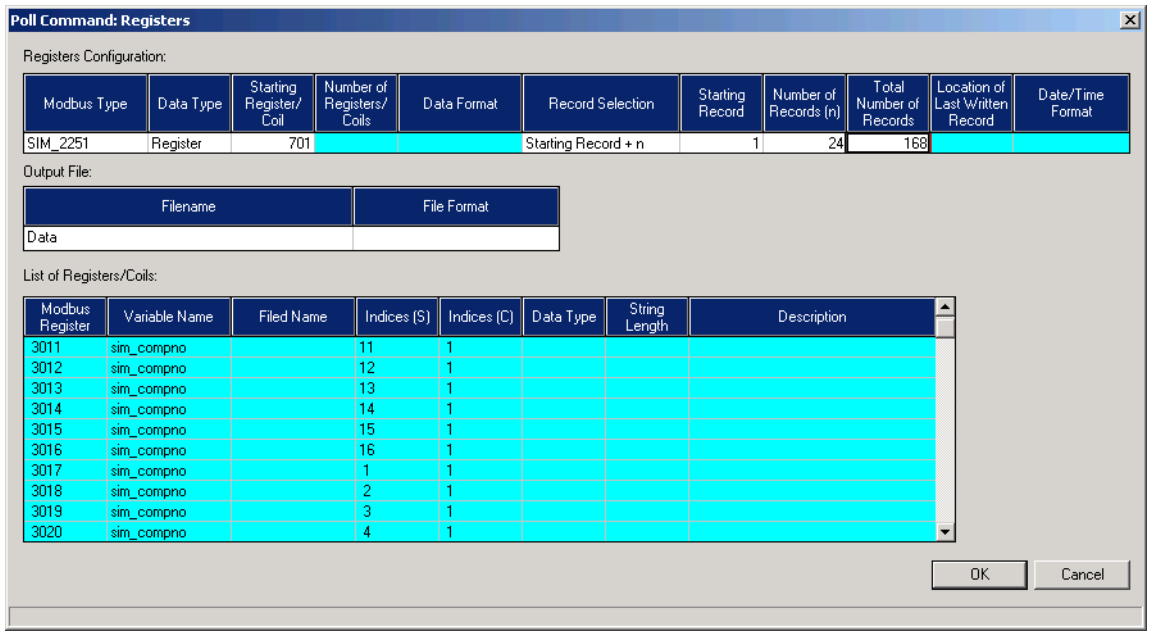
To configure the Registers command,

1. From the Configuration for Data Collection window, click the Add button to select another command.

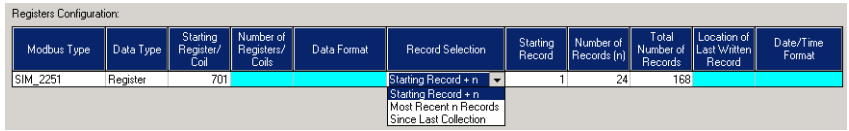



2. Next, select the **`Poll`** command.
3. Press the TAB key or click in the **`Type`** field, then select **`Registers`** from the pull-down menu.
4. Press the TAB key or click in the **`Command Description`** field. Assign a name for the Modbus Registers data file.

5. Click the Poll Command Details button and the Poll Command: Registers dialog box displays.




6. The user is presented with a dialog which includes the following information:
   - Modbus Type - SIM2251 or USER MODBUS (Modicon)
   - Data Type (Function Code)-Register or Coil (Boolean)
   - Starting Register (Coil) Number
   - Number of Registers (Coils) to request




If SIM_2251 is selected and the Starting Register is in the range 701 - 999, then Record Selection (options including starting Record +n, Most Recent **n**Records, and Since Last Collection) and Record Number

and Number of Records must be entered. Also, enter the Total Number of Records, location of Last Written Record, and Date/ Time Format, when applied.

If USER MODBUS is selected, and Data Type is Register, then the user must enter a Data Format string to define for each parameter being requested (an integer 16-bit or floating-point 32-bit value). Floating-point values use two consecutive registers for storage.

For the standard registers, the values returned are stored in a single record in the output file, following the Date and Time when the registers are polled, the Starting Register, and Number of Registers. Using SIM_2251 registers 701-999 registers, one record is stored in the output file for each record retrieved with fields within the record, starting the date and time when the record is polled, starting Register (701-999), Record Number, and the data for the record.

List of Registers/Coils:

| Modbus Register | Variable Name | Filed Name | Indices (S) | Indices (C) | Data Type | String Length | Description |
|---|---|---|---|---|---|---|---|
| 1001 | sysalarm_set | | 1 | 1 | | | Application Checksum Failure |
| 1002 | sysalarm_set | | 2 | 1 | | | ROM Checksum Failure |
| 1003 | sysalarm_set | | 3 | 1 | | | RAM Diagnostics Failure |
| 1004 | sysalarm_set | | 4 | 1 | | | A/D Converter Failure |
| 1005 | sysalarm_set | | 5 | 1 | | | Detector Oven Failure |
| 1006 | sysalarm_set | | 6 | 1 | | | Liquid Sample Valve Heater Failure |
| 1007 | sysalarm_set | | 7 | 1 | | | Sample System Oven Failure |
| 1008 | sysalarm_set | | 8 | 1 | | | Catalytic Converter Failure |
| 1009 | sysalarm_set | | 9 | 1 | | | Heater 5 Failure |
| 1010 | sysalarm_set | | 10 | 1 | | | Heater 6 Failure |

7. Click the OK button to apply the configuration changes.

   Or,

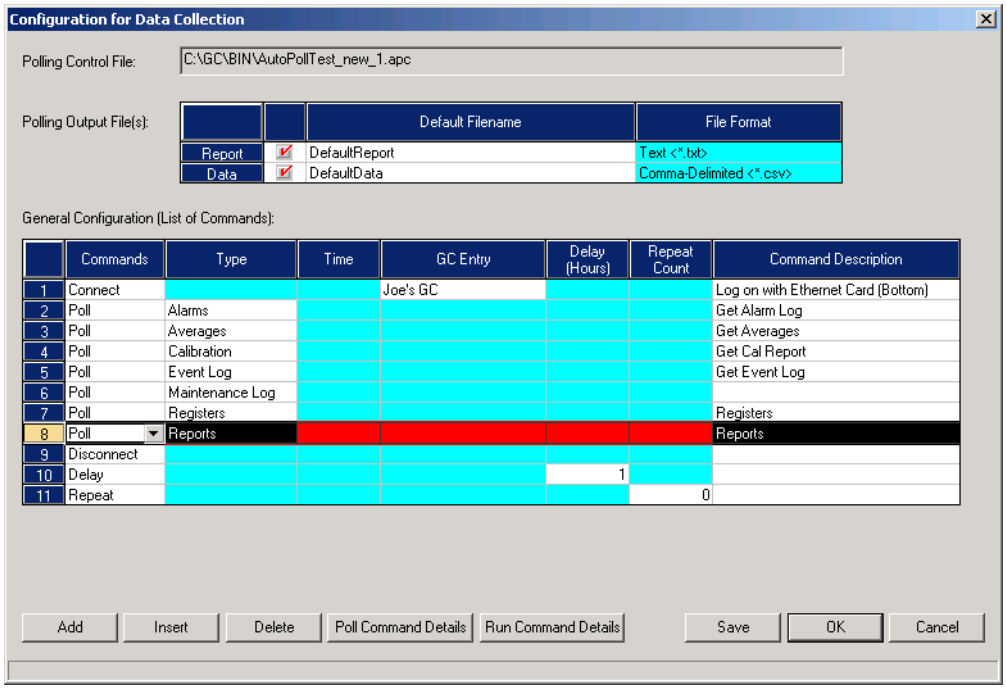
   Click the No button to discard your changes and return to the Configuration for Data Collection window.

### Reports Command

The archived analysis reports (as viewable under MON2000 when connected to a controller, from the *Reports>Archived Data>View Data* menu) can be retrieved and stored.

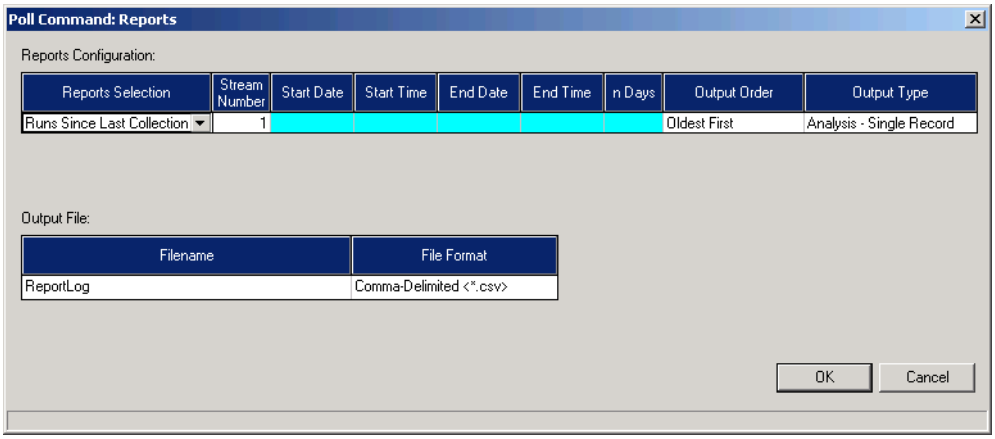
To configure the Reports command,

1. From the Configuration for Data Collection window, click the Add button to select another command.




2. Next, select the **`Poll`** command.
3. Press the TAB key or click in the **`Type`** field, then select **`Registers`** from the pull-down menu.
4. Press the TAB key or click in the **`Command Description`** field. Assign a name for the Reports data file.

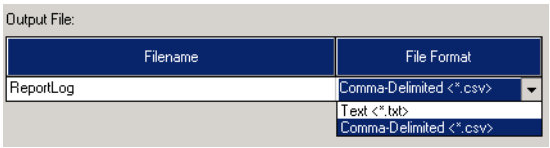
5. Click the Poll Command Details button and the Poll Command: Reports dialog box displays.

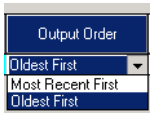



6. Use the following selection criteria and then enter appropriate data:

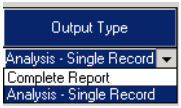
   - Time intervals defined by start date/time and end date/time and a stream number or zero to indicate all streams.
   - Most recent ndays, whereby user provides the number n and a stream number or zero to indicate all streams.
   - Runs since last collection, whereby the user provides a stream number or zero to indicate all streams.

7. Choose the file output format from the File Format pull-down menu.

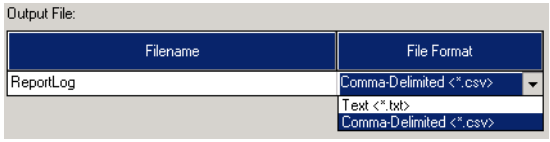





8. Regardless of the selection criteria method used above, choose the order of returned reports in the Output File (with most recent first or with oldest first).
9. Next, select the Output Type; as a complete report or an analysis (single record format).




10. Select the output file format. The reports are stored fully formatted ASCII text or stored in a comma-delimited file (.csv).




11. Click the OK button to apply the configuration changes.

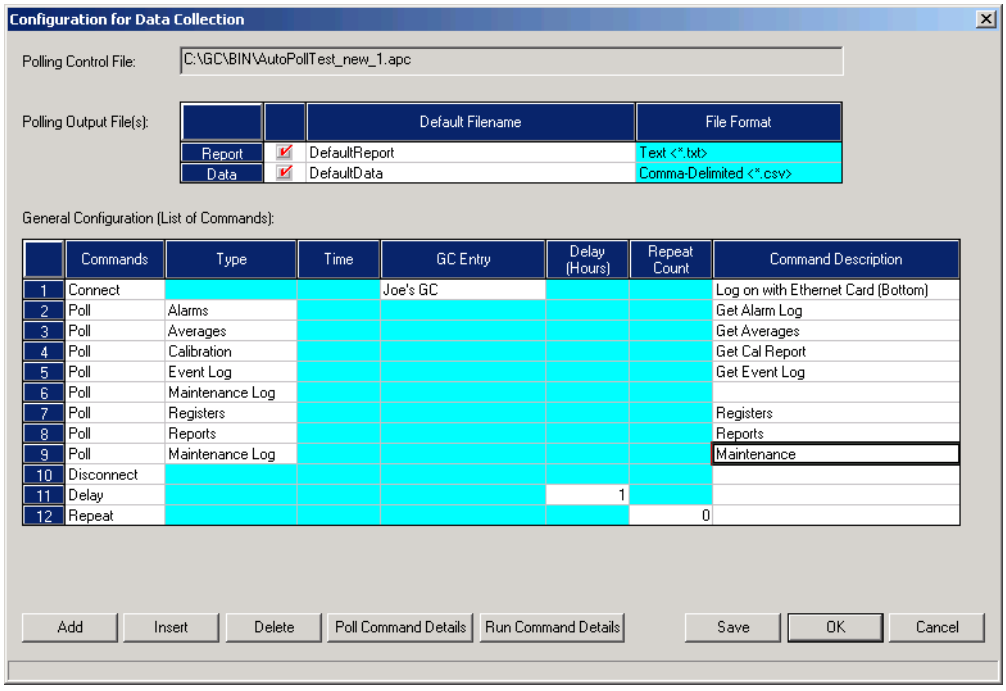
    Or,

    Click the No button to discard your changes and return to the Configuration for Data Collection window.

### Maintenance Log Command

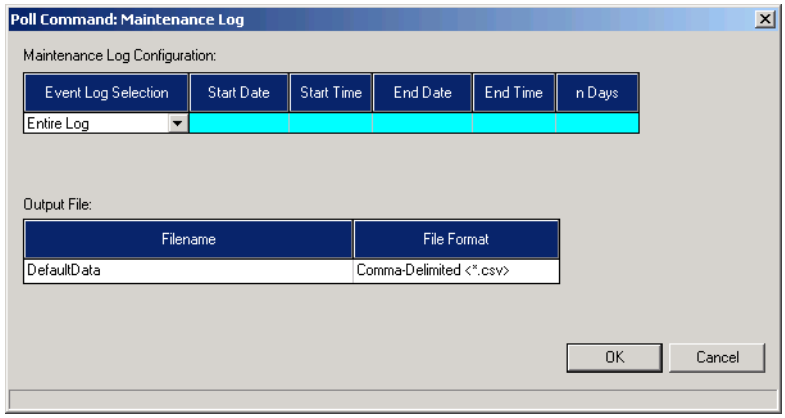
To configure the Maintenance Log command,

1. From the Configuration for Data Collection window, click the Add button to select another command.



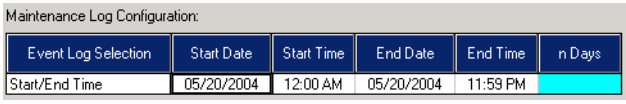

2. Next, select the **`Poll`** command.
3. Press the TAB key or click in the **`Type`** field, then select **`Maintenance Log`** from the pull-down menu.
4. Press the TAB key or click in the **`Command Description`** field. Assign a name for the Maintenance Log data file.

5. Click the Poll Command Details button and the Poll Command: Maintenance Log dialog box displays.

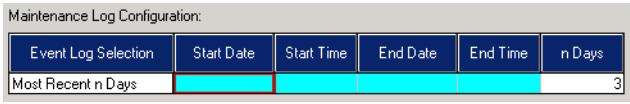



6. From the Event Log Selection field, select one of the following:

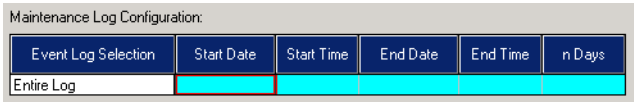
   - Start/End (insert the start and end date and start and end time)




   - Most Recent nDays (insert the number of days)



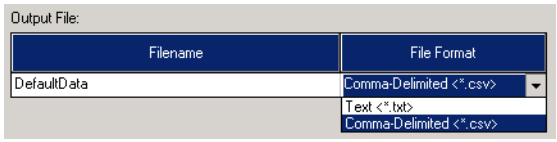

   - Entire Log (returns the entire Maintenance Log).



Each entry in the maintenance log configuration that satisfies the selection criteria, a record containing the following information is stored:

- Date/time of the log entered
- Log message

7. Select the output file format. The reports are stored fully formatted ASCII text or stored in a comma-delimited file (.csv).




8. Click the OK button to apply the configuration changes.

   Or,

   Click the No button to discard your changes and return to the Configuration for Data Collection window.

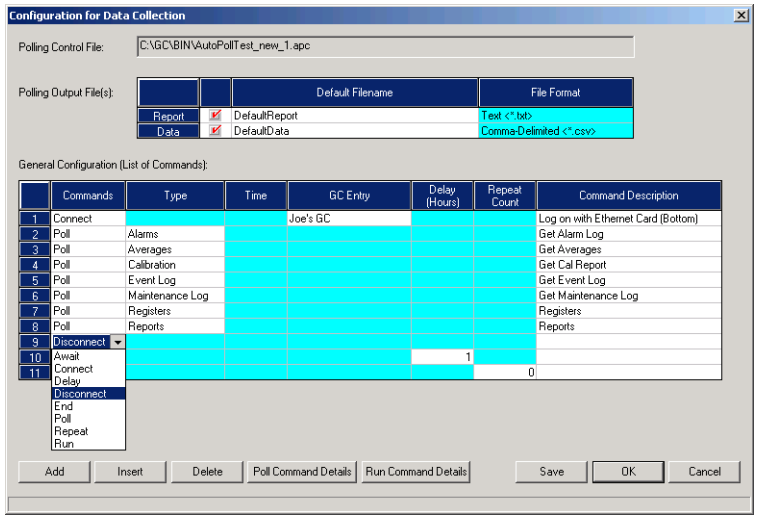
### Disconnect Command

Use the **Disconnect Command** to terminate communications with a currently connected GC Controller.

To configure the Disconnect command,

1. From the Configuration for Data Collection window, click the Add button to select another command.

2. Use the Command pull-down menu, and select DISCONNECT.




No additional input parameters are required for this command. Also note, if you are not connected to a GC Controller, this command is ignored.

3. Enter a title for the Disconnect Command in the Command Description field.

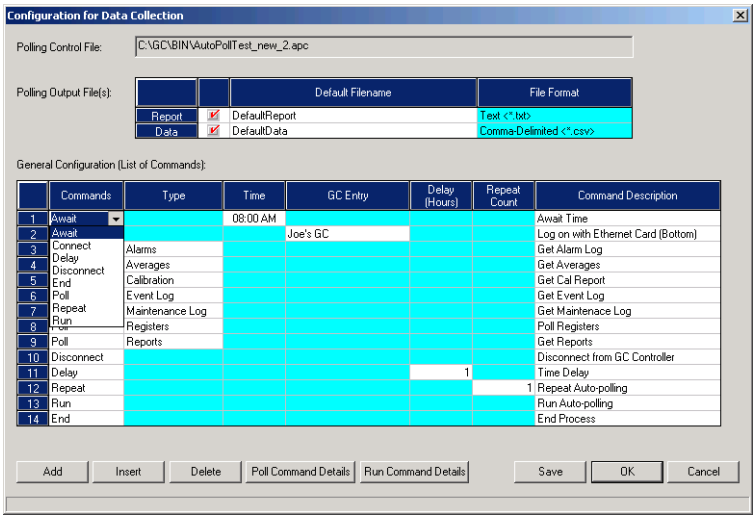
### Await Command

This command instructs the auto-sequencing module to wait for a specific time of day prior to processing the commands in the file. The user enters the desired time of day in hours and minutes.

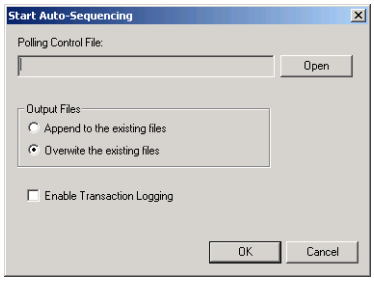
To configure the Await Command,

1. From the Configuration for Data Collection window, click the Add button to select another command.

2. Use the Command pull-down menu, and select AWAIT.



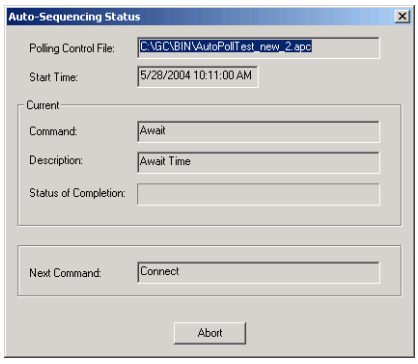

3. Insert the time in the Time field.
4. Enter a title for the Await command in the Command Description field.
5. From the MON2000 PLUS main window, select the *Data Collection>Start Auto* menu. the Start Auto-Sequencing dialog box is displayed.




6. Click the Open button and select the file.
7. Double-click the file or click the Open button.

8. Select the appropriate radio button (append to the existing file or overwrite the existing file).

9. Click the OK button and the Auto-Sequencing Status window displays.




   The Auto-Sequencing Status window shows the Polling command file name, Start Time (date and hour), the current command in the polling process, the Command Description, Status of Completion, and the Next Command in the polling command file.

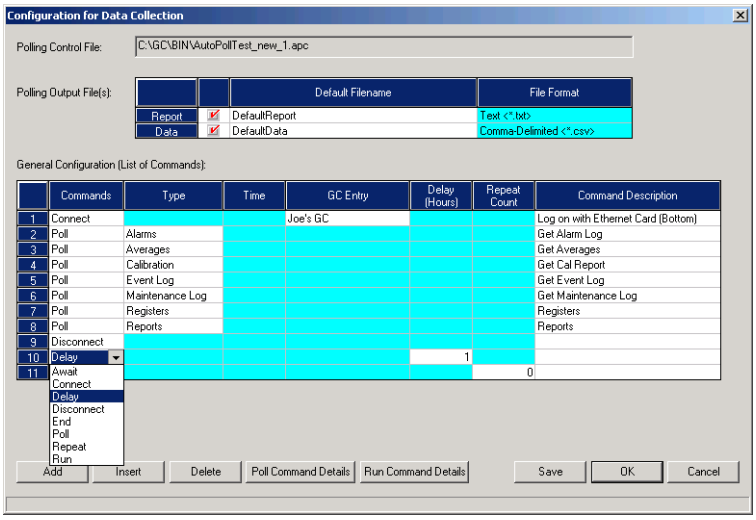
10. To halt the Auto-Sequencing process at anytime, click the Abort button.

### Delay Command

Prior to executing the auto-polling function, the **Delay Command** instructs the Auto-Sequencing module to delay for a specified interval of time. The user enters the time delay in one hour increments.

To configure the Delay Command,

1. From the Configuration for Data Collection window, click the Add button to select another command.
2. Use the Command pull-down menu, and select DELAY.



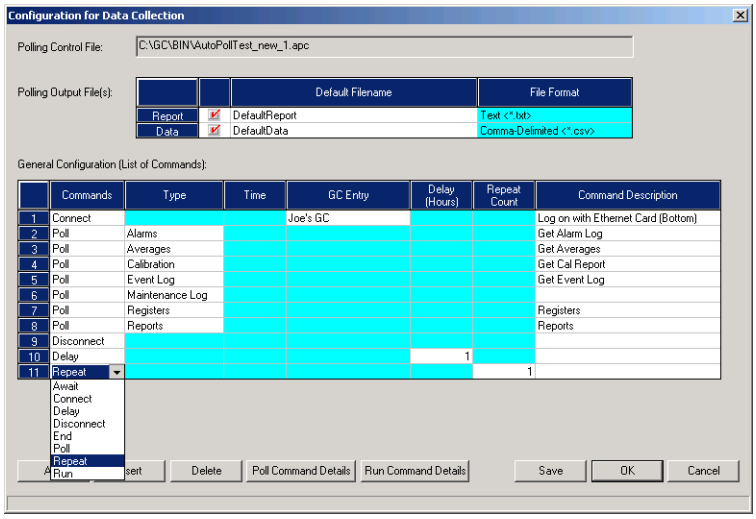

3. Insert the time delay, in one hour increments, in the Delay Hour(s) field.
4. Enter a title for the Delay Hours in the Command Description field.

### Repeat Command

Use the **Repeat Command** to instruct the Auto-Sequencing module to restart processing of the commands in the polling control file (from the beginning of the file). Specify a count that for the number of times to execute the sequence of commands in the file. Without a specified count (or with a count of zero) the sequence of commands will be re-executed indefinitely until terminated manually by the user.

To configure the Repeat command,

1. From the Configuration for Data Collection window, click the Add button to select another command.
2. Use the Command pull-down menu, and select **Repeat**.

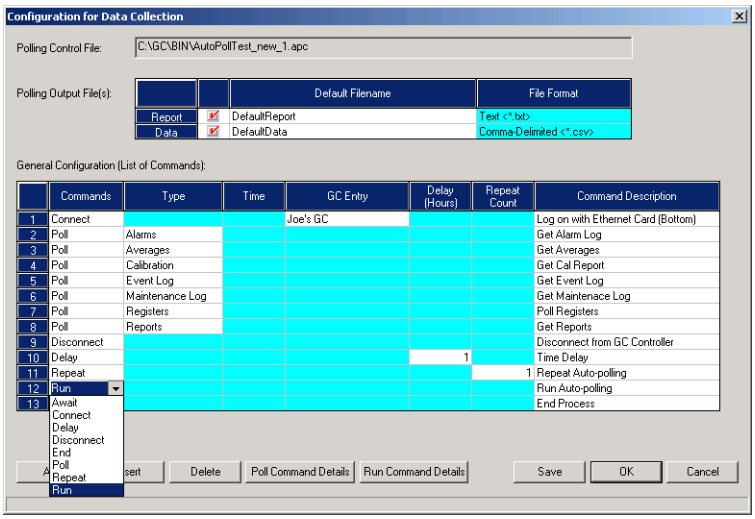



3. Insert the number of times to repeat the Auto-Sequencing process, in the Repeat Count field.
4. Enter a title for the Repeat Command in the Command Description field.

### Run Command

Use the **RUN COMMAND** to execute the Auto-Sequencing process.

1. From the Configuration for Data Collection window, click the Add button to select another command.
2. Use the Command pull-down menu, and select **R**un.

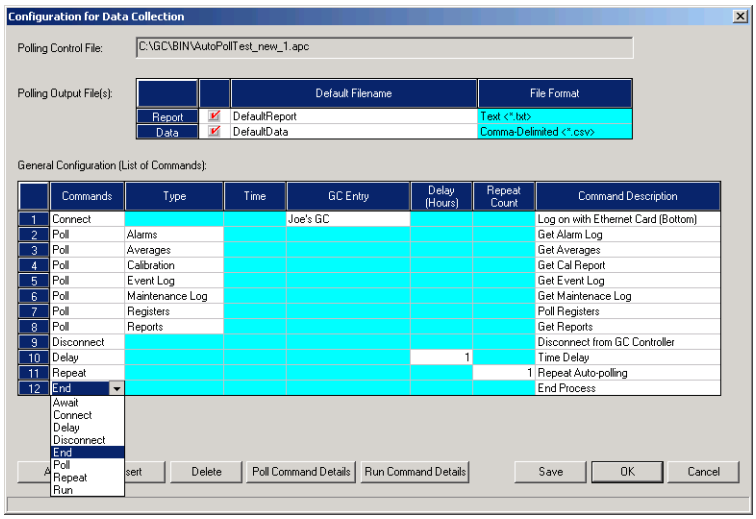



3. Enter a title for the Run Command in the Command Description field.

### End Command

Use the **End Command** to mark the end of the polling control file and signal the Auto-Sequencing module to stop processing.

1. From the Configuration for Data Collection window, click the Add button to select another command.
2. Use the Command pull-down menu, and select **End.**

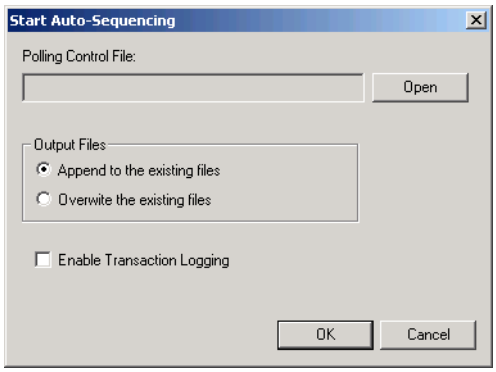



3. Enter a title for the End Command in the Command Description field.

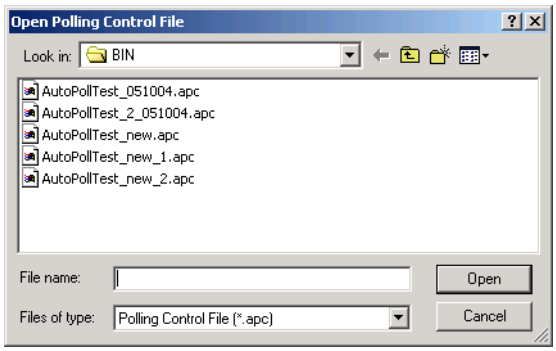
## 9.3 DATA COLLECTION

Initiate Auto-Sequencing from the MON2000 PLUS (for the file you just configured or open an existing file) *Data Collection>Start Auto* menu.

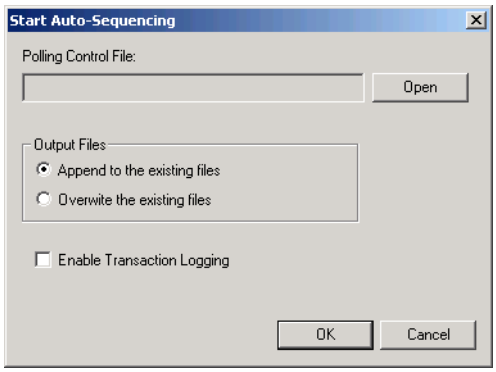
1. The Start Auto-Sequencing window displays.




2. Click the Open button and the Open Polling Control File window displays.



3. Select the desired polling control file, then click the Open button. The Start Auto-Sequencing window displays.

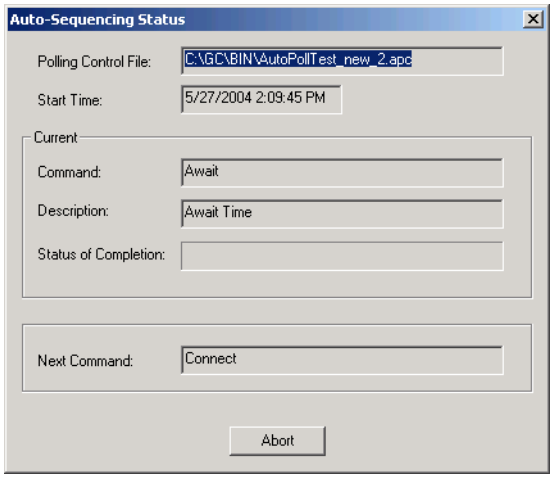



   Choose to append or overwrite the existing output files or abort the process.

   In the check box, select Enable Transaction Logging if desired (see Transaction Log this section).

4. Click the OK button to confirm the start of automatic operation.

   MON2000 PLUS begins the Auto-Sequencing process and displays the data collection and status.



5. The module begins with the first command in the selected polling control file and performs the requested operation.

   Processing continues sequentially through the file performing the operations requested by each command.

   If a repeat command is encountered, then the processing is restarted at the beginning of the file.

   If an end command (or the end -of -file) is encountered, the module closes all open files and control returns to the MON2000 PLUS program.

### Auto-Sequencing Status

During Auto-Sequencing a status display is maintained on the screen. As each individual command is processed the following general information is displayed. Depending on the command being processed, the details of the exact data included will vary:

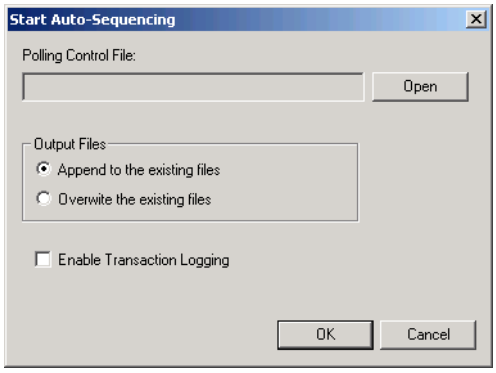
- Polling Control file in use
- Start time of operation
- Command being processed
- Description of command being processed
- Status of completion of the command. (Level detail appropriate to the individual command)
- Next Command to be processed.

Auto-Sequencing must be stopped before other MON2000 PLUS menu selections are chosen.

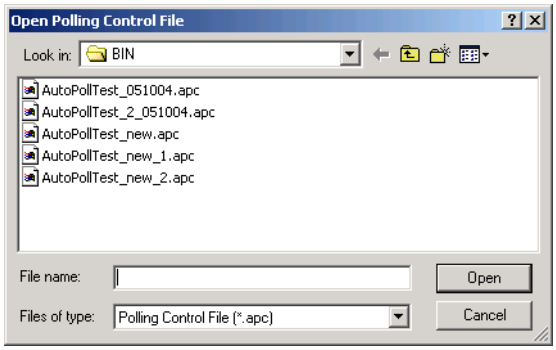
To begin the Auto-Sequencing process,

1. Use the *Data Collection>Start Auto* menu,

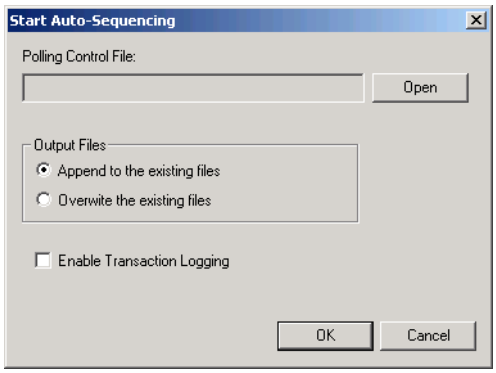
2. The Start Auto-Sequencing window displays.




3. Click the Open button and the Open Polling Control File window displays.



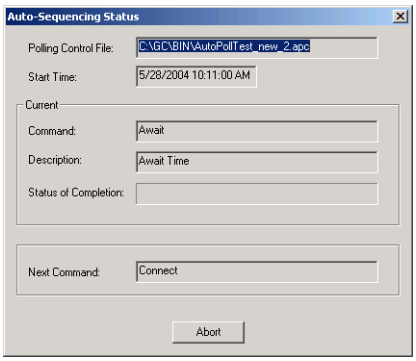

4. Select the desired polling control file, then click the Open button. The Start Auto-Sequencing window displays.



5. Choose to append or overwrite the existing output files or abort the process.

   In the check box, select Enable Transaction Logging if desired (see Transaction Log this section).

6. Click the OK button and the Auto-Sequencing Status window displays.




   The Auto-Sequencing Status window shows the Polling command file name, Start Time (date and hour), the current command in the polling process, the Command Description, Status of Completion, and the Next Command in the polling command file.

To halt the Auto-Sequencing process at anytime, click the Abort button.

### Stop Auto-Sequencing

Terminate Auto-Sequencing at any time by clicking the Abort button on the Auto-Sequencing Status display screen. If this occurs, the Auto-Sequencing module will disconnect if connected to a GC Controller. Close all open output files and return to normal operation of the MON2000 PLUS program.

### Transaction Log

When starting Auto-Sequencing, enable Transaction Logging by clicking in the check box.

If this option is chosen, a log file is opened and one or more entries are made to the file each time a command is executed.

Transaction Log entries include a time stamp and a description of the command being executed. If the command results in modbus messages being exchanged between the PC and the controller, then the poll message from the PC and the response from the controller will be displayed.

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# MODBUS TEST

The Modbus Test Program (WinMB) enables you to test the operation of the serial port communications, and determine Modbus register and log contents. Use this program as an aid to software debugging or for special installations. Via WinMB, you can troubleshoot with any device including the GC Controller, an ultrasonic meter, or a flow computer.

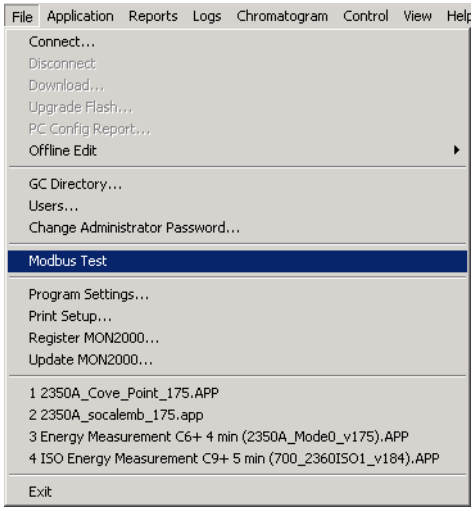
**CAUTION**

**FUNCTION NOT REQIURED FOR NORMAL GC OPERATION**

**The Modbus test is reserved for advanced functions**

The Modbus Test function is not required for normal GC operation. Skip this section unless you are developing software, engaging in a software debugging process, or designing a custom installation that directly accesses the GC Controller Modbus registers.

Traditionally, Modbus registers are polled by using a data collection system (DCS). To facilitate installation and debugging, the WinMB program emulates a DCS.



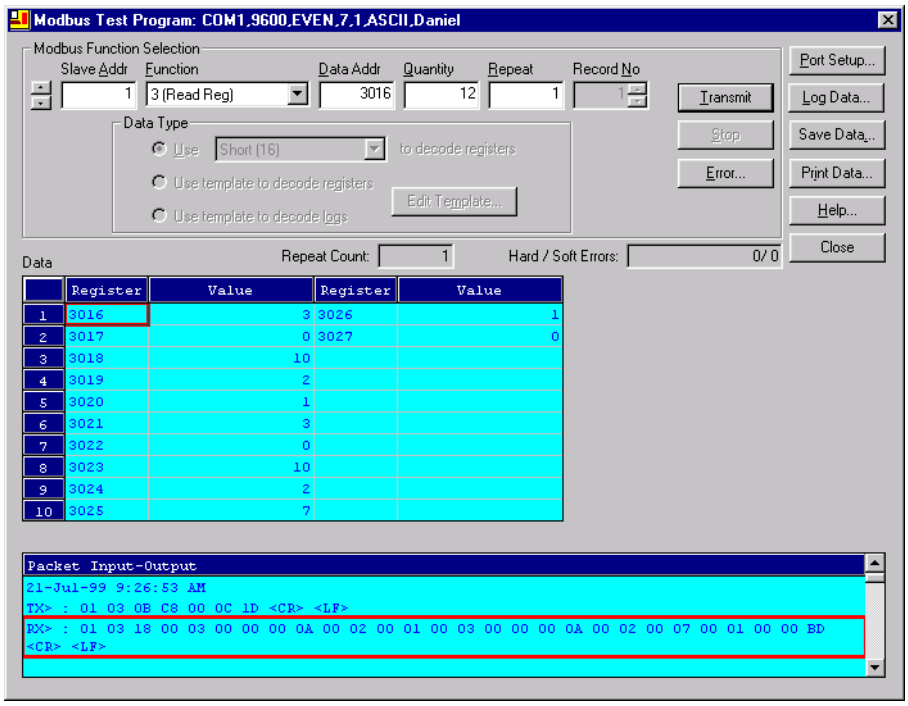

This section provides detailed instructions for using the WinMB program. Use this program only if you are familiar with Modbus communication protocol and the operation of the MON2000 software.

## 10.1 STARTING WINMB

To start WinMB from MON2000, pull down the File menu and click the *Modbus Test* option.

If MON2000 displays an error, verify the installation directory via the Program Settings function (see Section 2.14.2).

The Modbus Test Program main window appears.




## 10.2 ESTABLISHING COMMUNICATIONS

Use the following instructions to configure the desired communications settings.

If you are accessing WinMB via MON2000, WinMB defaults to the same communications and serial port settings as those set for MON2000. To set up a WinMB-specific configuration, see Section 10.2.3.

### 10.2.1 Comparison of Modbus Protocols

MON2000 software and the WinMB program accommodate two different Modbus protocols: SIM_2251 and User_Modbus. For each protocol, separate Modbus registers are reserved.

Thus some settings for MON2000 and WinMB depend on which Modbus protocol is used.

The protocol you need depends, ultimately, on the hardware used for data acquisition from the GC Controller Modbus register contents.

The following comparison should help clarify the differences between these protocols as well as the utility of each.

*Table 10-1 Comparison of SIM_2251 and User_Modbus Protocols*

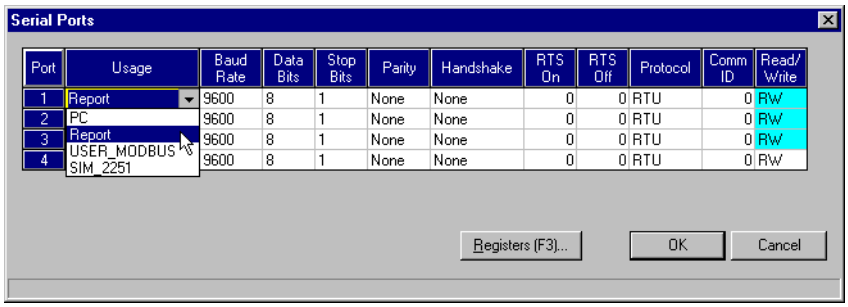
| **SIM_2251** | **User_Modbus** |
|---|---|
| serial slave port | serial slave port |
| modified protocol that allows floating point numbers to be transmitted over Modbus via 2251 emulation slave type | standard Gould protocol that accommodates PLC Emulation LO-HI (PLC-LH) |
| most register contents are predefined; some registers can be user-defined | predefined Boolean (coils)<br>user-defined Numeric (registers) |
| data types are predefined for registers 1000 to 9000 | data types are user-defined |
| variables assigned to registers can be listed in the PC Config Report (for instructions, see Section 2.14.3; for an example report, see Appendix A). See Appendix F for more detail about individual registers. | variables assigned to registers can be listed in the PC Config Report (for instructions, see Section 2.14.3; for example report, see Appendix A) |
| When using WinMB, set *Register Mode* to "DANIEL" to view register contents. | When using WinMB, set *Register Mode* to "PLC- LH" or "PLC-HL" to view register contents. |
| It is not necessary to assign scales to registers. | It may be necessary to assign scales to registers, to convert floating point values to whole integer representations. |

### 10.2.2 Set GC Com Parameters via MON2000

Set the communication parameters for the GC Controller serial port to which your PC, or other device, is connected.

To determine or reset the communications parameters at the GC Controller,

1. Use the *Application* > *Serial Ports* menu to access the Serial Ports function. The Serial Ports dialog appears.




2. Verify the MON2000 serial port Usage setting.

   (a) Determine the GC Controller serial port to which you are directly connected.

   (b) In the Serial Ports dialog, ensure that the Usage setting for the port is either "SIM-2251" or "User_Modbus".

   If the setting is incorrect, change it by using the provided combo box.

3. Verify the *Baud Rate* setting.

   WinMB accepts the following baud rates: 300, 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600, 115200.

4. Ensure the remaining serial port parameters are correct. Revise as required and record for future reference.

**NOTICE**

**Consult accurate documentation of the GC installation or visually inspect the serial line connection at the GC Controller Terminal Board.**

Typical settings are:

*Table 10-2 Typical GC Communications Parameters*

| Parameter | RTU Setting | ASCII Setting |
|---|---|---|
| Data Bits | 8 | 7 |
| Stop Bits | 1 | 1 |
| Parity | None | Even |
| Handshake | None | None |
| RTS On | 0 | 0 |
| RTS Off | 0 | 0 |
| Ptrcl | RTU | ASCII |

**NOTICE**

**RTS On/Off settings are required only when line settling is needed before data transmission begins.**

Note that the RTU protocol permits a more efficient data transmission for it uses significantly less bits than ASCII.

5. Check the *Com ID* setting. The Com ID is the slave address defined by MON2000.

**NOTICE**

**Record the true Device ID number for future use.**

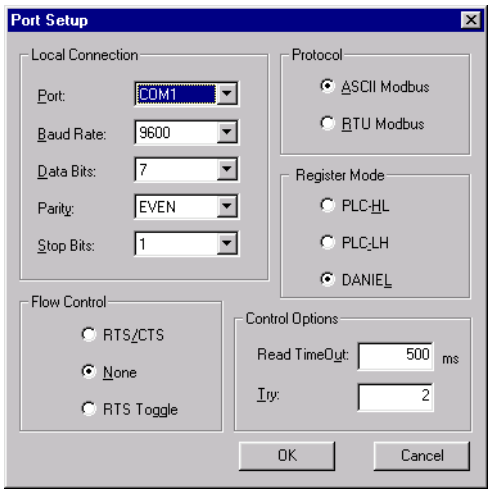
6. Verify that the *RW* setting is either "R" or "RW".

7. Click the OK button to accept your input and return to the main screen.

### 10.2.3 Set Up Port via WinMB

To determine or reset the communications parameters used by WinMB,

1. Click the Port Setup... button to access the Port Setup function. The Port Setup dialog appears.




2. Define the WinMB serial port setup options.

*Table 10-3 Typical WinMB Port Parameters*

| Parameter | Typical Setting |
|---|---|
| Port | COM1 or COM2 |
| Baud Rate | 9600 |
| Data Bits | 7 or 8 |
| Parity | Even or None |
| Stop Bits | 1 |
| Flow Control | None |
| Control Options | Read Timeout, 500 ms<br>Try, 2 |
| Register Mode | Daniel (for SIM_2251):<br>PLC-LH (for User_Modbus)<br>PLC-LH |
| Protocol | ASCII Modbus<br>RTU Modbus |

**NOTICE**

**The serial port settings displayed are for the serial communication parameters at the PC. These settings must match the GC Controller settings (to verify, see Section 10.2.2).**

**For direct connection to the GC Controller, ensure that the Port setting is the same as the Com ID number of the serial port used.**

3. Click the OK button to accept your input and return to the main screen.

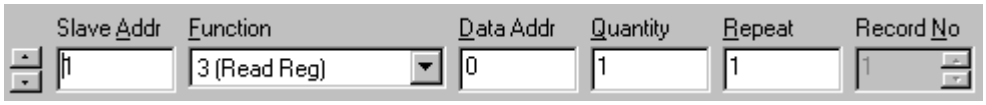
## 10.3 GETTING MODBUS DATA

**NOTICE**

**To access previous settings, use the spin arrows to view and select.**

Use the following steps to read or write register contents to the GC Controller (or any other device). See the following subsections for additional details.

Before retrieving data, print a PC Config Report (see Section 2.14.3) and check the Communication data for variable names assigned to the Modbus registers.




1. In the *Slave Addr* data field, type the Comm ID of the GC unit (or other device). WinMB will accept a slave address of 1 to 247.

   Enter "0" to use the broadcast mode. In the broadcast mode, WinMB polls all known devices. Each device interprets this message as an instruction to read and take action; however, a response message may not be received by WinMB.

**NOTICE**

**Any change is applied to the corresponding register value at each device. Table 10-4 shows which function codes support the broadcast mode.**

2. Use the *Function* pull-down menu to select the desired read or write option.

*Table 10-4 Available Modbus Function Codes*

| Function Code | Description | Broadcast |
|---|---|---|
| 1 (Read Coil) | read one or more coil values | |
| 3 (Read Reg) | read one or more register values | |
| 5 (Set Single Coil) | set (write) one coil value | ✓ |
| 5 (Set Single Reg) | set (write) one register value | ✓ |
| 15 (Set Multiple Coils) | set (write) multiple coil values | ✓ |
| 16 (Set Multiple Regs) | set (write) multiple register values | ✓ |

3. In the *Data Addr* data field, type the starting register.

   Note that the data type is set automatically by WinMB, per the specified data address. Use the *Data Type* pull-down menu to select a different data type for these registers.

**NOTICE**

**To ensure best data type assignments, review a PC Config Report (see Section 2.14.3 to view a live report; see Section 7.1 to view a report file; see Appendix A for a sample report).**

*Table 10-5 Default Data Type per Register Range for SIM_2251*

| Register Range | Default Type |
|---|---|
| 1000 – 2999 | Boolean |
| 3000 – 4999 | Integer |
| 5000 – 6900 | Long |
| 7000 – 8999 | Float |

   To select data types for SIM_2251 registers 1000 to 9000, see Section 10.3.2.

4. In the *Quantity* data field, type the number of registers to be retrieved (range from 1 to 2016).

**NOTICE**

**Boolean registers are not user-defined (for either SIM_2251 or User_Modbus) and primarily contain alarm flags useful for debugging. To view the contents of Boolean registers, select the "1 (Read Coil)" function code.**

**Numeric registers for User_Modbus can be user-defined (see Section 5.16.4). To view the contents of Numeric registers, select the "3 (Read Regs)" function code.**

Note that the requested number of registers cannot exceed the amount contained by the selected message block but you can retrieve a partial block. You cannot cross a message block boundary.

Also note that in Standard Modbus mode each register is 16 bits. Therefore, integers (SHORT) consist of 1 register while floats (FLOAT) and long integers (LONG) consist of 2 registers.

5. Type the desired repeat count (how many times WinMB will read or set the specified registers before ceasing transmission) in the *Repeat* data box.

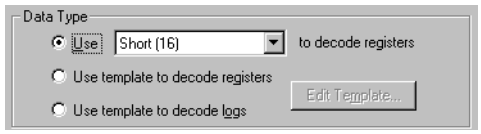
   You can repeat the poll from 1 to 9999 times. A Repeat value of "–1" produces an infinite polling loop that can be terminated by clicking the Stop button.

### 10.3.1 Use Single Data Type

Use this function to assign a data type to a group of registers you will read or edit.

To poll a group of registers with the same user-defined data type,

1. Follow Steps 1 through 5 in Section 10.3.
2. Click the *Use <Type> to decode registers* radio button to choose this option.




3. Use the Data Type pull-down menu to assign a data type to the selected registers (see Section 10.3, Steps 3 and 4).

4. Click the Transmit button to retrieve the selected registers (i.e., the specified data addresses) from the GC Controller (or other device).

   Click the Stop button to cease transmission and return to the Modbus Function Selection options.

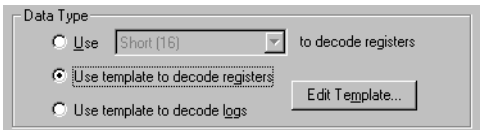
   Note that the transmitted/received packet displays in the Packet Input-Output window.

### 10.3.2 Use Template (Mixed Data Types)

Use this function to create a new template or use an existing template file to directly decode Modbus register data retrieved from the GC Controller (or other device). Via the configuration of a given template, WinMB imposes the specified data types, etc., onto the incoming registers. The Template function is best used when decoding mixed data types.

To create a new template or use an existing template,

1. Follow Steps 1 through 5 in Section 10.3.
2. Use the Data Type radio buttons to select the desired template option, to *decode registers* or *decode logs*.



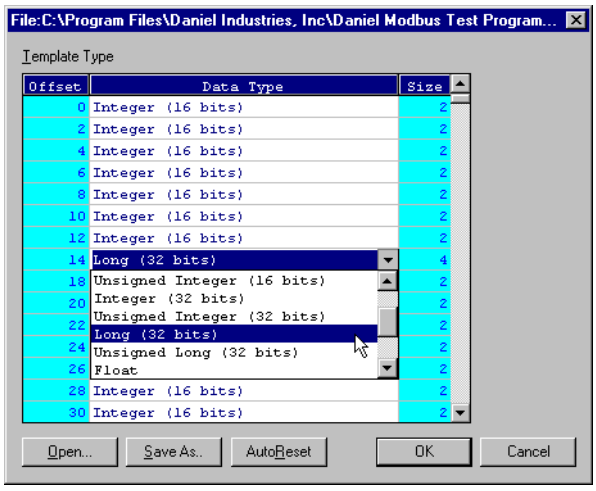

3. Note that the *Record No.* setting is now available. Enter the desired record by typing in the provided data field or using the scroll arrows.

*Table 10-6 Using Record Numbers with Templates*

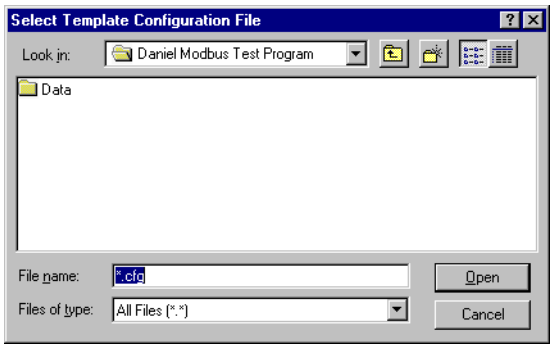
| Data Type Setting | Other Setting(s) | Result |
|---|---|---|
| register template | • Enter *Data Addr* value.<br>• Enter *Record No.* value.<br>• Enter *Quantity* value. | Read Quantity fields (i.e., the number of fields specified by the Quantity setting) from the specified Record No. of the register (Data Addr). |
| log template | • Enter *Record No.* value. | Read all fields associated with the Record No. |
| | • Enter *Data Addr* value.<br>• Enter "0" for the *Record No.* value. | Read all fields in all records for the specified log register (Data Addr). |

To verify which record number should be entered, consult the Modbus specifications for your device. For more information on GC Modbus registers, see Appendix F.

4. Click the Edit Template... button. The Template File dialog appears with a new template displayed.



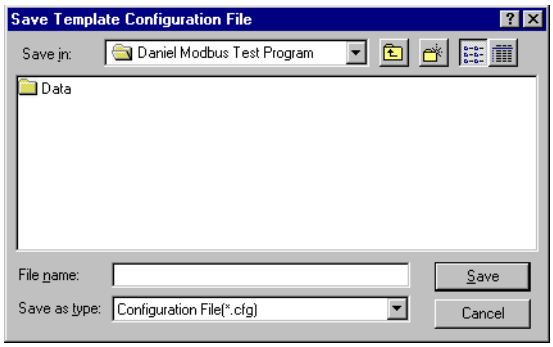
5. To open an existing template file, click the Open... button. The Select Template Configuration File dialog appears.




   Use the directory tree to locate the desired file (e.g., temp1.cfg), highlight it, and then click the Open button.

6. To edit the displayed file,
   - Use the provided combo boxes to select a different data type. The Offset and Size values change to accommodate the data type.
   - Click the AutoReset button to change all template data types to the type last selected.

7. To save the displayed file to disk, click the Save As.. button. The Select Template Configuration File dialog appears.



Use the directory tree to specify the desired location. Either select an existing file or type the new file name (e.g., temp2.cfg) in the *File name* data field. Then click the Save button.

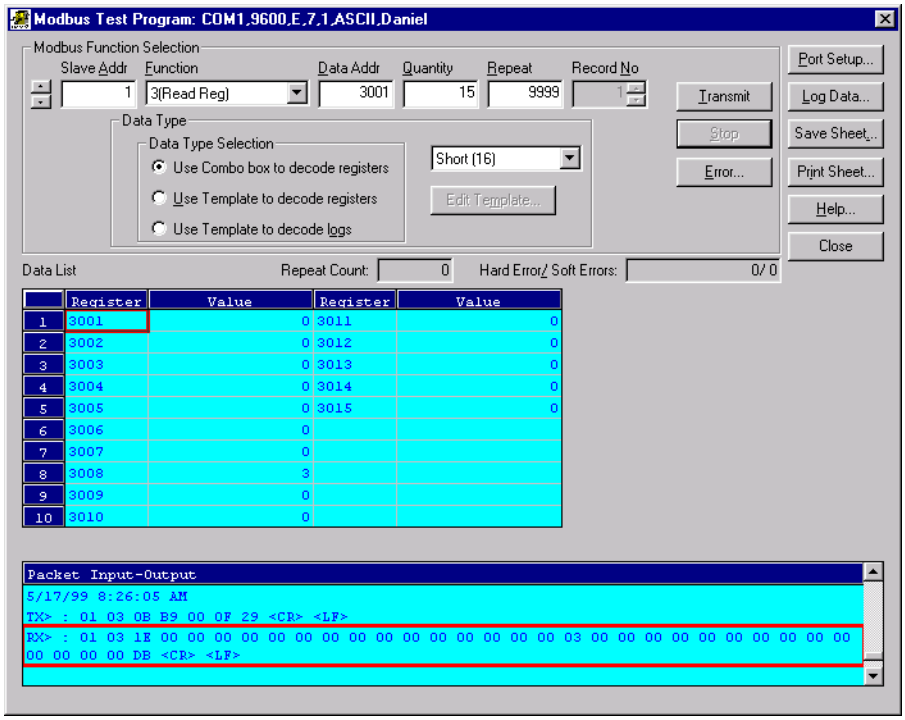
8. Click the OK button to apply your selections and return to the main window.

   Click the Cancel button to return to the main window without applying your selections.

## 10.4 USING MODBUS DATA

Use WinMB to poll the GC Controller Modbus registers (or, registers from another device), confirming that data is being accurately relayed from the GC Controller to the PC. Then, as necessary, assign data types to the returned data (see Section 10.4.3). You can save all settings to file for future reference.

To launch the WinMB program from MON2000, use the *File* > *Modbus Test* menu (see Section 10.1 for additional options).




## 10.4.1 Set Log Parameters

The Log Data function allows you to log the polled data to a specified file.

To set the log parameters for WinMB,

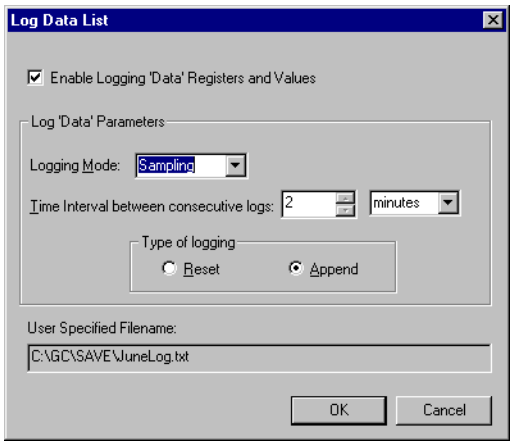
1. Click the Log Data... button to access the Log Data function. The Log Data List dialog appears.
2. Click the *Enable Logging* check box to turn this function ON and to access the Log Data Parameters.

**NOTICE**

**The Log Data function is not required for transmission of Modbus data.**

**To disable this function, deselect the *Enable Logging* check box.**

3. Use the *Logging Mode* pull-down menu to select either a Sampling or Continuous mode.




*Continuous* mode records the polled data continuously until the connection is terminated or the Log Data function is disabled (see Step 2).

*Sampling* mode records the polled data per the user-defined Time Interval (e.g., every 2 minutes).

4. Select the desired logging type.

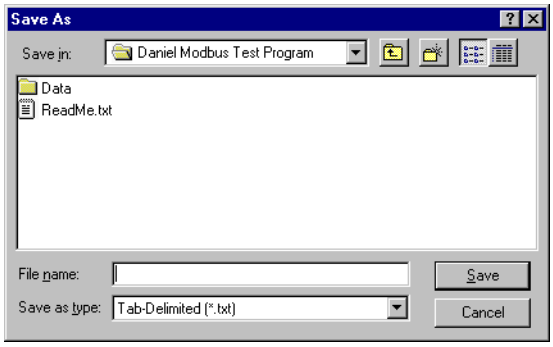
   *Append* adds this log to the file specified, preserving previously logged data.

   *Reset* deletes the previously logged data and saves only this new log.

5. Click the OK button to apply your selections and return to the main window. Go to Step 6.

   Click the Cancel button to return to the main window without applying your selections.

6. The Save As dialog appears.




Use the directory tree to specify the desired location and choose a format type. Either select an existing file or type the new file name in the *File name* data field.

7. Click the Save button to create this log file, apply your selections, and return to the main window.

   Click the Cancel button to abort and return to the main window.

**NOTICE**

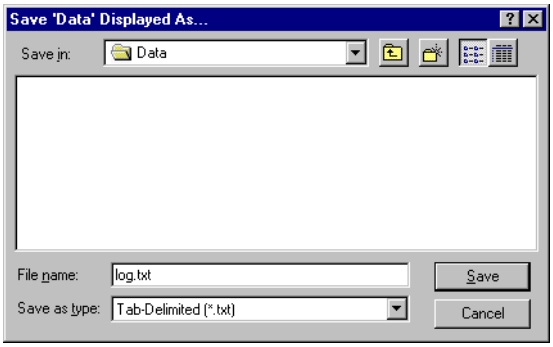
**You can save log data in any of these formats:**

- **.txt, ASCII tab-deliminated**
- **.xls, Excel**
- **.htm, HTML**

### 10.4.2 Save Modbus Data

To save the data table in a separate file,

1. Click the Save button to access the Save Data function. The Save Data Displayed dialog appears.



**NOTICE**

**You can save log data in any of these formats:**

- **.txt, ASCII tab-deliminated**
- **.xls, Excel**
- **.htm, HTML**

2. Use the directory tree to specify the desired location and either select an existing file or type the new file name in the *File name* data field.

3. Click the Save button to save this data and return to the main window.

   Click the Cancel button to return to the main window without saving this data.

### 10.4.3 Assign Scale Ranges for User_Modbus

This is an optional task that applies to applications using the User_Modbus protocol. By assigning scale ranges, floating point data can be converted to integer values.

Use the Serial Ports, Edit Register List function to assign scale ranges. See Section 5.16.4 for detailed instructions. See Appendix F for more information regarding GC Modbus registers.

### 10.4.4 Print Modbus Data

To print the transmitted data, click the Print Data... button. The standard Windows® print dialog appears.

MON2000 prints the report to your configured printer (see Section 3.7).

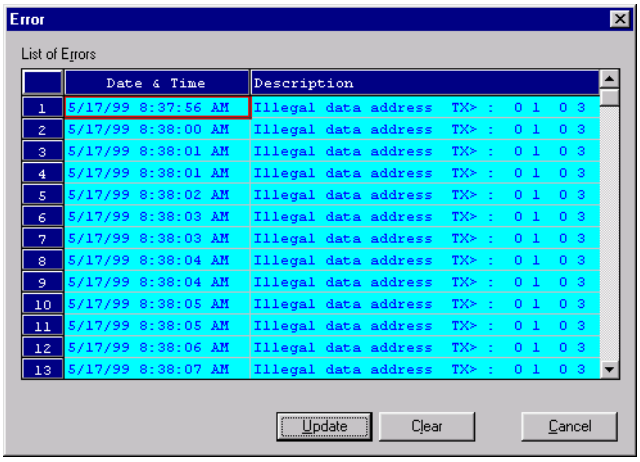
## 10.5 TROUBLESHOOTING COMMUNICATION ERRORS

The WinMB Communication Error Log is maintained in a circular buffer that holds up to 512 entries.

WinMB tracks the errors for a given session but does not store them. When you exit WinMB, all errors are cleared.

To view any communication errors that occurred during the data transfer, from the *File>Modbus Test* menu,

1. Click the Error... button to access the Communication Error Log function. The Error dialog appears.


Error
List of Errors
Date & Time
Description
1 5/17/99 8:37:56 AM Illegal data address TX> : 0 1 0 3
2 5/17/99 8:38:00 AM Illegal data address TX> : 0 1 0 3
3 5/17/99 8:38:01 AM Illegal data address TX> : 0 1 0 3
4 5/17/99 8:38:01 AM Illegal data address TX> : 0 1 0 3
5 5/17/99 8:38:02 AM Illegal data address TX> : 0 1 0 3
6 5/17/99 8:38:03 AM Illegal data address TX> : 0 1 0 3
7 5/17/99 8:38:03 AM Illegal data address TX> : 0 1 0 3
8 5/17/99 8:38:04 AM Illegal data address TX> : 0 1 0 3
9 5/17/99 8:38:04 AM Illegal data address TX> : 0 1 0 3
10 5/17/99 8:38:05 AM Illegal data address TX> : 0 1 0 3
11 5/17/99 8:38:05 AM Illegal data address TX> : 0 1 0 3
12 5/17/99 8:38:06 AM Illegal data address TX> : 0 1 0 3
13 5/17/99 8:38:07 AM Illegal data address TX> : 0 1 0 3
Update
Clear
Cancel

**NOTICE**

**Double-click a Description cell to "scroll through" the displayed text.**

2. To view all errors that have occurred in this session, click the Update button.

   To delete all entries to date, click the Clear button.

3. Click the Cancel button to return to the main window.

## 10.6 USING MODBUS TEST ONLINE HELP

Use the WinMB online help file to quickly access reference terminology, function descriptions, and other related information.

See the following sections for more information.

### 10.6.1 How to Access

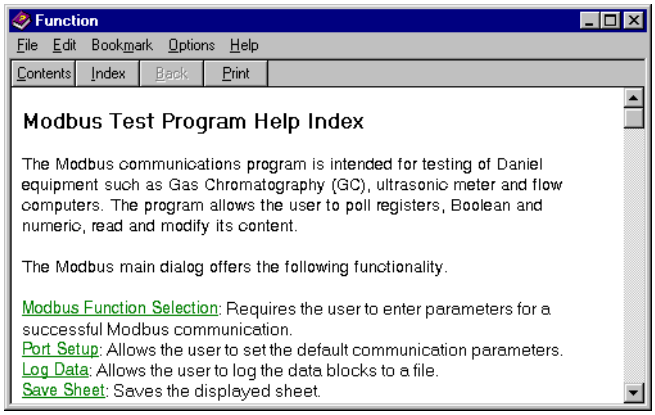
To access online help, use the *File>Modbus Test* menu to display the Modbus Help test dialog, then,

- Press F1 on your PC keyboard

  Or,

- Click the Help... button located on the toolbar.

The Modbus Test Program Help Index displays.


Function
File Edit Bookmark Options Help
Contents Index Back Print
Modbus Test Program Help Index
The Modbus communications program is intended for testing of Daniel equipment such as Gas Chromatography (GC), ultrasonic meter and flow computers. The program allows the user to poll registers, Boolean and numeric, read and modify its content.
The Modbus main dialog offers the following functionality.
Modbus Function Selection: Requires the user to enter parameters for a successful Modbus communication.
Port Setup: Allows the user to set the default communication parameters.
Log Data: Allows the user to log the data blocks to a file.
Save Sheet: Saves the displayed sheet.

### 10.6.2 How to Navigate

To navigate within this help file,

- Click the Contents button to display an index, a topic-tree contents menu, and a search function.
- Click the Index button to display an index where you can select a specific term.
- Click the Back button to return to the last topic viewed.
- Click the Print button to print the current topic.

Use the scroll bars and arrows to display more of a topic. You can also resize and/or move the topic window for better viewing convenience.

When applicable, a topic will contain links to other related topics. Use these links as you need.

# APPENDIX A, PC CONFIG REPORT

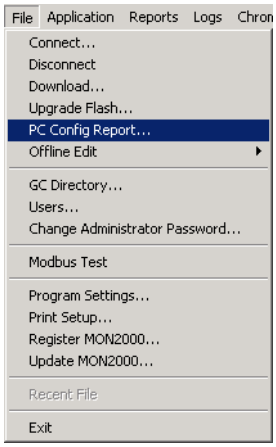
This appendix explains how to print a PC Config Report and provides an example for reference.

## A.1 HOW TO PRINT

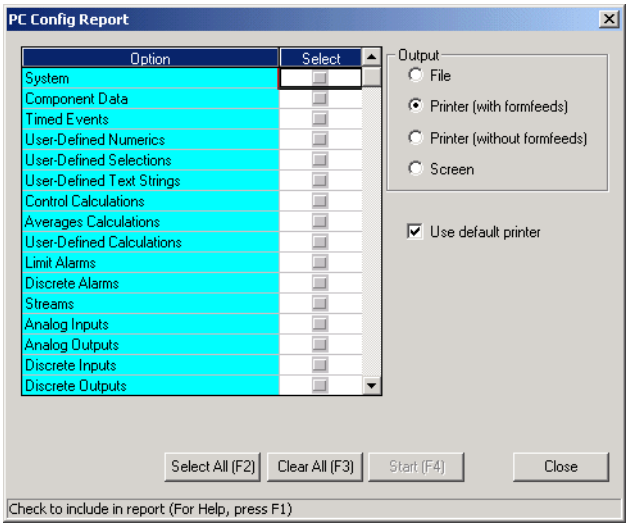
**NOTICE**

**Output data for the PC Config Report depends on the GC Controller and its application.**

Use the following instructions to print the current application settings for the online GC. To view a PC Config Report already saved to disk, see Section 7.1.2.




1. Use the *File* > *PC Config Report* menu to access this function. The PC Config Report window appears.
2. Click the check boxes (see *Select* column) to choose the option you want included in the configuration report.




Click the Select All (F2) button or press the F2 key to select all options.

Click the Clear All (F3) button or press F3 to deselect (i.e., clear) all checked options.

3. Use the *Output* radio buttons to either save the report to disk, print the report with or without form feeds, or display on screen.

   If you want to use the standard Windows® Print dialog to select a printer, uncheck the *Use default printer* option.

4. Click Start (F4) the button or press the F4 key to generate your customized PC Config Report and print or save this file.

   By default, if a print option is selected, MON2000 will print the report to your configured printer (see Section 3.7).

**NOTICE**

**If you are online with the GC Controller, a PC Config Report that includes all options can require up to 20 minutes to generate and save. Printing a full report can take longer.**

**If you press the ESC key, MON2000 will stop after the current option is completed.**

## A.2 EXAMPLE REPORT

This example PC Config Report, on the following pages, represents a typical report that includes all sections. It is provided for reference only.

System Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

| Description | Value |
|---|---|
| Stream Sequence | 1 |
| Aux. Stream Sequence | |
| Analyzer Name | 2350_001 |
| Unit Type | 2350 |
| System Description | 2350 Standard 1 - 64 avgs |
| Chromatogram Buffers Size | 21000 |
| Max Peaks | 64 |
| Number of Valves | 5 |
| Daylight Saving Time | Normal |
| CGM Analog Output Config | 0 |
| Baseline Offset | 12 |
| CFG Baseline Number | 1 |
| Metric Base Conditions | Off |
| Max. Archive Averages | 64 |
| Max. Archive Avg. Records | 64 |
| CFG Revision Level | 150 |
| CFG Base Name | USASTD1 |

**********

Component Data Table Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

Component Data Table #1

| No. | Component | U/S | DetID | RetTime | Resp Factor | F/V | CalConc | AnalMthd |
|---|---|---|---|---|---|---|---|---|
| 1 | C6+ 47/35/17 | STD | 1 | 30.2 | 2013490 | VAR | 0.0289 % | AREA |
| 2 | PROPANE | STD | 1 | 50.2 | 1316330 | VAR | 1.0 % | AREA |
| 3 | i-BUTANE | STD | 1 | 65.7 | 1520820 | VAR | 0.3 % | AREA |
| 4 | n-BUTANE | STD | 1 | 73.6 | 1545350 | VAR | 0.3 % | AREA |
| 5 | NEOPENTANE | STD | 1 | 86.3 | 1651260 | VAR | 0.1 % | AREA |
| 6 | i-PENTANE | STD | 1 | 109.4 | 1715050 | VAR | 0.0993 % | AREA |
| 7 | n-PENTANE | STD | 1 | 121.6 | 1793230 | VAR | 0.0999 % | AREA |
| 8 | NITROGEN | STD | 1 | 149.5 | 782820 | VAR | 2.5 % | AREA |
| 9 | METHANE | STD | 1 | 153.1 | 637330 | VAR | 89.5719 % | AREA |
| 10 | CARBON DIOXIDE | STD | 1 | 179.2 | 953088 | VAR | 1.0 % | AREA |
| 11 | ETHANE | STD | 1 | 200.6 | 1060440 | VAR | 5.0 % | AREA |

| No. | Component | RTDev | SecDev | Updt | RFDev | GRSBTU | NETBTU | MolWgt | AGA8 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | C6+ 47/35/17 | 3 | 2 | CAL | 10 | 5288.7 | 4900.5 | 95.96 | C6mix1 |
| 2 | PROPANE | 3 | 2 | CAL | 10 | 2521.9 | 2320.3 | 44.1 | PROPANE |
| 3 | i-BUTANE | 3 | 2 | CAL | 10 | 3259.4 | 3007.3 | 58.12 | i-BUTANE |
| 4 | n-BUTANE | 3 | 2 | CAL | 10 | 3269.8 | 3017.4 | 58.12 | n-BUTANE |
| 5 | NEOPENTANE | 3 | 3 | CAL | 10 | 3993.9 | 3691.4 | 72.15 | i-PENTANE |
| 6 | i-PENTANE | 3 | 4 | CAL | 10 | 4010.2 | 3707.6 | 72.15 | i-PENTANE |
| 7 | n-PENTANE | 3 | 4 | CAL | 10 | 4018.2 | 3715.5 | 72.15 | n-PENTANE |
| 8 | NITROGEN | 3 | 2 | CAL | 10 | 0 | 0 | 28.01 | NITROGEN |
| 9 | METHANE | 3 | 3 | CAL | 10 | 1012.3 | 911.5 | 16.04 | METHANE |
| 10 | CARBON DIOXIDE | 3 | 4 | CAL | 10 | 0 | 0 | 44.01 | CO2 |
| 11 | ETHANE | 3 | 5 | CAL | 10 | 1773.7 | 1622.4 | 30.07 | ETHANE |

| No. | Component | Lb/Gal | GPMFactor | Reid Vapor | RelDenGas | RelDenLqd |
|---|---|---|---|---|---|---|
| 1 | C6+ 47/35/17 | 5.6681 | 0.4462 | 3.0194 | 3.3132 | 0.68 |
| 2 | PROPANE | 4.227 | 0.2756 | 188.64 | 1.5226 | 0.507 |
| 3 | i-BUTANE | 4.693 | 0.3271 | 72.591 | 2.0068 | 0.5629 |
| 4 | n-BUTANE | 4.869 | 0.3153 | 51.709 | 2.0068 | 0.584 |
| 5 | NEOPENTANE | 4.975 | 0.383 | 35.9 | 2.4911 | 0.5967 |
| 6 | i-PENTANE | 5.206 | 0.3661 | 20.445 | 2.4912 | 0.6244 |
| 7 | n-PENTANE | 5.261 | 0.3622 | 15.574 | 2.4912 | 0.6311 |
| 8 | NITROGEN | 6.748 | 0.1096 | 0 | 0.9672 | 0.8094 |
| 9 | METHANE | 2.5 | 0.1695 | 5000 | 0.5539 | 0.3 |
| 10 | CARBON DIOXIDE | 6.82 | 0.1704 | 0 | 1.5196 | 0.818 |
| 11 | ETHANE | 2.97 | 0.2675 | 800 | 1.0382 | 0.3562 |

| No. | Component | HVSupMJ/m3 | HVInfMJ/m3 | HVSupMJ/kg | HVInfMJ/kg | M_RelDens |
|---|---|---|---|---|---|---|
| 1 | C6+ 47/35/17 | 196.98 | 182.52 | 48.557 | 44.99 | 0.6803 |
| 2 | PROPANE | 93.936 | 86.42 | 50.368 | 46.34 | 0.5078 |
| 3 | i-BUTANE | 121.41 | 112.01 | 49.388 | 45.57 | 0.5635 |
| 4 | n-BUTANE | 121.79 | 112.4 | 49.546 | 45.72 | 0.5846 |
| 5 | NEOPENTANE | 148.76 | 137.49 | 48.75 | 45.06 | 0 |
| 6 | i-PENTANE | 149.36 | 138.09 | 48.949 | 45.25 | 0.6249 |
| 7 | n-PENTANE | 149.66 | 138.38 | 49.045 | 45.35 | 0.6316 |
| 8 | NITROGEN | 0 | 0 | 0 | 0 | 0.8093 |
| 9 | METHANE | 37.708 | 33.948 | 55.575 | 50.034 | 0.3 |
| 10 | CARBON DIOXIDE | 0 | 0 | 0 | 0 | 0.8227 |
| 11 | ETHANE | 66.065 | 60.43 | 51.95 | 47.52 | 0.3581 |

**********

Timed Event Table Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

Timed Event Table #1

Analysis Time 225  Cycle Time  240  Sample Valve Y N N N N

---

| | | | | |
|---|---|---|---|---|
| Valve # 2 | ON | | @ | 0.0 |
| Inhibit | ON | 1 | @ | 0.0 |
| Valve # 3 | ON | | @ | 2.0 |
| Slope Sens | 8 | 1 | @ | 3.0 |
| Detector 1 | 6 | | @ | 4.0 |
| Valve # 1 | ON | | @ | 5.0 |
| Strm Switch | | | @ | 7.0 |
| Peak Width | 4 | 1 | @ | 8.0 |
| Valve # 1 | OFF | | @ | 10.0 |
| Valve # 2 | OFF | | @ | 23.0 |
| Inhibit | OFF | 1 | @ | 26.0 |
| Inhibit | ON | 1 | @ | 36.0 |
| Valve # 3 | OFF | | @ | 42.0 |
| Inhibit | OFF | 1 | @ | 46.0 |
| Inhibit | ON | 1 | @ | 97.0 |
| Peak Width | 8 | 1 | @ | 100.0 |
| Inhibit | OFF | 1 | @ | 101.0 |
| Inhibit | ON | 1 | @ | 139.0 |
| Detector 1 | 1 | | @ | 140.0 |
| Valve # 3 | ON | | @ | 142.0 |
| Peak Width | 3 | 1 | @ | 143.0 |
| Inhibit | OFF | 1 | @ | 146.0 |
| Detector 1 | 5 | | @ | 169.0 |
| Inhibit | ON | 1 | @ | 170.0 |
| Peak Width | 8 | 1 | @ | 173.0 |
| Inhibit | OFF | 1 | @ | 174.0 |
| Inhibit | ON | 1 | @ | 223.0 |

**********

User-Defined Numeric Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

| No. | Name | Type | Value |
|---|---|---|---|

No entries found.

**********

User-Defined Selection Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

| No. | Name | Options |
|---|---|---|
| 1 | EnableCalMan | 2 |
| 2 | EnableComAlm | 2 |
| 4 | Maint_mode | 1 |
| 5 | Run_Aux_Seq | 1 |

Options for EnableCalMan

| No. | Name |
|---|---|
| 1 | DISABLE |
| 2 | ENABLE |

Options for EnableComAlm

| No. | Name |
|---|---|
| 1 | DISABLE |
| 2 | ENABLE_NC |
| 3 | ENABLE_NO |

Options for Maint_mode

| No. | Name |
|---|---|
| 1 | OFF |
| 2 | ON |

Options for Run_Aux_Seq

| No. | Name |
|---|---|
| 1 | OFF |
| 2 | ON |

**********

User-Defined Text Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

| No. | Name | Size | Text |
|---|---|---|---|
| 1 | rpt_header1 | 50 | Company: Daniel Industries |
| 2 | rpt_header2 | 50 | |

**********

Calculation Control Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

| Description | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Avg Limit Alarm Test | Y | Y | Y | Y | Y | Y | Y | Y |
| Mole Percent | Y | Y | Y | Y | Y | Y | Y | Y |
| Liquid Volume | N | N | N | N | N | N | N | N |
| Weight Percent | N | N | N | N | N | N | N | N |
| Normalize Results | N | N | N | N | N | N | N | N |
| Gas Density | N | N | N | N | N | N | N | N |
| Liquid Density | N | N | N | N | N | N | N | N |
| Relative Density Gas | N | N | N | N | N | N | N | N |
| Relative Density Lqd | N | N | N | N | N | N | N | N |
| Compressibility | N | N | N | N | N | N | N | N |
| Dry Gross Heating BTU | N | N | N | N | N | N | N | N |
| Sat Gross Heating BTU | N | N | N | N | N | N | N | N |
| Actual Gross Heating BTU | N | N | N | N | N | N | N | N |
| Dry Net Heating BTU | N | N | N | N | N | N | N | N |
| Sat Net Heating BTU | N | N | N | N | N | N | N | N |
| Actual Net Heating BTU | N | N | N | N | N | N | N | N |
| Wobbe Index | N | N | N | N | N | N | N | N |
| Reid Vapor Pressure | N | N | N | N | N | N | N | N |
| Gallons/1000 SCF C2+ | N | N | N | N | N | N | N | N |
| Gallons/1000 SCF C3+ | N | N | N | N | N | N | N | N |
| Gallons/1000 SCF C4+ | N | N | N | N | N | N | N | N |
| Gallons/1000 SCF C5+ | N | N | N | N | N | N | N | N |
| Gallons/1000 SCF C6+ | N | N | N | N | N | N | N | N |
| User Flag 1 | N | N | N | N | N | N | N | N |
| Average Molecular Wgt | N | N | N | N | N | N | N | N |
| HeatVal Sup Dry MJ/m3 | N | N | N | N | N | N | N | N |
| HeatVal Sup Sat MJ/m3 | N | N | N | N | N | N | N | N |
| HeatVal Sup Act MJ/m3 | N | N | N | N | N | N | N | N |
| HeatVal Inf Dry MJ/m3 | N | N | N | N | N | N | N | N |

HeatVal Inf Sat MJ/m3 N N N N N N N N

HeatVal Inf Act MJ/m3 N N N N N N N N

HeatVal Sup Dry MJ/kg N N N N N N N N

HeatVal Inf Dry MJ/kg N N N N N N N N

HeatVal Sup Dry Kc/m3 N N N N N N N N

HeatVal Sup Sat Kc/m3 N N N N N N N N

HeatVal Sup Act Kc/m3 N N N N N N N N

HeatVal Inf Dry Kc/m3 N N N N N N N N

HeatVal Inf Sat Kc/m3 N N N N N N N N

HeatVal Inf Act Kc/m3 N N N N N N N N

HeatVal Sup Dry Kc/kg N N N N N N N N

HeatVal Inf Dry Kc/kg N N N N N N N N

Metric Rel Dens Lqd N N N N N N N N

Metric Gas Density N N N N N N N N

Metric Lqd Density N N N N N N N N

**********

Calculation Average Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

Resets

Time: 00:00

Weekday: Sun

Day of Month: 1

No. Variable Name S C

---

Hourly

No entries found.

24 Hour

No entries found.

Weekly

No entries found.

Monthly

No entries found.

Variable

No entries found.

**********

Calculation User-Defined Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

| No. | Variable | S | C |
|---|---|---|---|
| 1 | label 1 | | |
| | Avg. Molecular Weight | 1 | 1 |
| | + Gallons/1000 SCF | 1 | 1 |
| | * Gas Density lbm/1000 ft3 | 1 | 1 |
| | / Heating Value Gross BTU Dry | 1 | 1 |
| | - Mole Percent | 1 | 1 |
| 2 | label 2 | | |
| | Gallons/1000 SCF | 1 | 2 |
| | + Gallons/1000 SCF | 1 | 3 |
| | + User Calc Result | 1 | 1 |
| | + Value 1: 16.2 | 1 | 1 |

**********

Limit Alarms Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

| No. | Variable | S | C | DO | Type |
|---|---|---|---|---|---|

No entries found.

**********

Discrete Alarms Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

| Alarm No. | Discrete Input | Discrete Output | Alarm Message |
|---|---|---|---|
| 1 | 0 | 0 | |
| 2 | 0 | 0 | |
| 3 | 0 | 0 | |
| 4 | 0 | 0 | |
| 5 | 0 | 0 | |

**********

Streams Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

| | | | | | | | | Cal Data | | | Base Condition | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Name | Use | Det | CD | TE | Tot | Avg | Start | Int | Auto | PSIA | °F |
| 1 | Stream 1 | ANL | Det1 | 1 | 1 | 5 | 3 | 07:00 | 24 | Y Y | 14.73 | 60 |
| 2 | Stream 2 | ANL | Det1 | 1 | 1 | 5 | 3 | 07:00 | 24 | Y Y | 14.73 | 60 |
| 3 | Stream 3 | ANL | Det1 | 1 | 1 | 5 | 3 | 07:00 | 24 | Y Y | 14.73 | 60 |
| 4 | Stream 4 | ANL | Det1 | 1 | 1 | 5 | 3 | 07:00 | 24 | Y Y | 14.73 | 60 |
| 5 | Stream 5 | ANL | Det1 | 1 | 1 | 5 | 3 | 07:00 | 24 | Y Y | 14.73 | 60 |
| 6 | Stream 6 | ANL | Det1 | 1 | 1 | 5 | 3 | 07:00 | 24 | Y Y | 14.73 | 60 |
| 7 | Stream 7 | ANL | Det1 | 1 | 1 | 5 | 3 | 07:00 | 24 | Y Y | 14.73 | 60 |
| 8 | Stream 8 | ANL | Det1 | 1 | 1 | 5 | 3 | 07:00 | 24 | Y Y | 14.73 | 60 |

No calibration streams defined

Optional Base Pressures

| No. | Name | Op Base Pres 1 | Op Base Pres 2 | Op Base Pres 3 |
|---|---|---|---|---|
| 1 | Stream 1 | 0 | 0 | 0 |
| 2 | Stream 2 | 0 | 0 | 0 |
| 3 | Stream 3 | 0 | 0 | 0 |
| 4 | Stream 4 | 0 | 0 | 0 |
| 5 | Stream 5 | 0 | 0 | 0 |
| 6 | Stream 6 | 0 | 0 | 0 |
| 7 | Stream 7 | 0 | 0 | 0 |
| 8 | Stream 8 | 0 | 0 | 0 |

**********

Analog Input Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

| No. | Label | Zero Scale | Full Scale | F/V | Fixed Value |
|---|---|---|---|---|---|
| 1 | AI 1 | 0 | 100 | VAR | 0 |

**********

Analog Output Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

| No. | Variable | S | C |
|---|---|---|---|
| 1 | Mole Percent | 1 | 1 |

| No. | Zero Scale | Full Scale | F/V | Fixed Value |
|---|---|---|---|---|
| 1 | 0 | 100 | VAR | 0 |

Bargraph

| No. | Variable | Streams | Component |
|---|---|---|---|
| 1 | Mole Percent | 1 | 1 |
| 2 | Not Used | | 1 |
| 3 | Not Used | | 1 |
| 4 | Not Used | | 1 |
| 5 | Not Used | | 1 |
| 6 | Not Used | | 1 |
| 7 | Not Used | | 1 |
| 8 | Not Used | | 1 |
| 9 | Not Used | | 1 |
| 10 | Not Used | | 1 |
| 11 | Not Used | | 1 |
| 12 | Not Used | | 1 |
| 13 | Not Used | | 1 |
| 14 | Not Used | | 1 |
| 15 | Not Used | | 1 |
| 16 | Not Used | | 1 |

Scaling Values

| No. | Zero Scale | Full Scale |
|---|---|---|
| 1 | 0 | 100 |
| 2 | 0 | 100 |
| 3 | 0 | 100 |
| 4 | 0 | 100 |
| 5 | 0 | 100 |
| 6 | 0 | 100 |
| 7 | 0 | 100 |
| 8 | 0 | 100 |
| 9 | 0 | 100 |
| 10 | 0 | 100 |
| 11 | 0 | 0 |
| 12 | 0 | 0 |
| 13 | 0 | 0 |
| 14 | 0 | 0 |
| 15 | 0 | 0 |
| 16 | 0 | 0 |

**********

Discrete Input Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

| No. | Label | Switch |
|---|---|---|
| 1 | DI 1 | AUTO |
| 2 | DI 2 | AUTO |
| 3 | DI 3 | AUTO |
| 4 | DI 4 | AUTO |
| 5 | AUX_STRM_SEQ | AUTO |

**********

Discrete Output Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

| No. | Label | Switch | On-Time | Off-Time |
|---|---|---|---|---|
| 1 | DO 1 | AUTO | 00:00 | 00:00 |
| 2 | DO 2 | AUTO | 00:00 | 00:00 |
| 3 | DO 3 | AUTO | 00:00 | 00:00 |
| 4 | Common_Alarm | AUTO | 00:00 | 00:00 |
| 5 | Calib-Maint | AUTO | 00:00 | 00:00 |

Valve Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

| No. | Label | Switch |
|---|---|---|
| 1 | Valve 1 | AUTO |
| 2 | Valve 2 | AUTO |
| 3 | Valve 3 | AUTO |
| 4 | Valve 4 | AUTO |
| 5 | Valve 5 | AUTO |

Serial Port Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

| Port | Usage | Baud Rate | Data Bits | Stop Bits | Parity | Hand-shaking | RTS ON | RTS OFF | Protocol | Comm ID | Read Write |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | USER_MODBUS | 9600 | 8 | 1 | None | None | 0 | 0 | RTU | 0 | RW |
| 2 | SIM_2251 | 9600 | 8 | 1 | None | None | 0 | 0 | RTU | 3 | RW |
| 3 | PC | 9600 | 8 | 1 | None | None | 0 | 0 | RTU | 0 | RW |
| 4 | PC | 9600 | 8 | 1 | None | None | 0 | 0 | RTU | 0 | RW |

Global Data Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

| No. | Variable name | Indices S | Indices C | Type | No. of Chars. |
|---|---|---|---|---|---|
| 1 | cal_run_num | 1 | 1 | Integer | |
| 2 | sim_abtu | 1 | 1 | Float | |
| 3 | sim_alarm | 16 | 1 | Integer | |
| 4 | sim_anlytime | 1 | 1 | Integer | |
| 5 | sim_cal | 1 | 1 | Integer | |
| 6 | sim_cal_abtu | 1 | 1 | Float | |
| 7 | sim_cal_comp | 1 | 1 | Float | |
| 8 | sim_cal_dbtu | 1 | 1 | Float | |
| 9 | sim_cal_gpm | 1 | 1 | Float | |
| 10 | sim_cal_rden | 1 | 1 | Float | |
| 11 | sim_cal_sbtu | 1 | 1 | Float | |
| 12 | sim_cal_unno | 1 | 1 | Float | |
| 13 | sim_cal_wobb | 1 | 1 | Float | |
| 14 | sim_calcycle | 1 | 1 | Long | |
| 15 | sim_char | 1 | 1 | Char | 1 |
| 16 | sim_compno | 16 | 4 | Integer | |
| 17 | sim_compress | 1 | 1 | Float | |
| 18 | sim_cycday | 1 | 1 | Integer | |
| 19 | sim_cychour | 1 | 1 | Integer | |
| 20 | sim_cycmin | 1 | 1 | Integer | |
| 21 | sim_cycmonth | 1 | 1 | Integer | |
| 22 | sim_cyctime | 1 | 1 | Long | |
| 23 | sim_cycyear | 1 | 1 | Integer | |
| 24 | sim_day | 1 | 1 | Integer | |

| | | | | |
|---|---|---|---|---|
| 25 | sim_dbtu | 1 | 1 | Float |
| 26 | sim_dummy | 4 | 1 | Float |
| 27 | sim_gpmwt | 16 | 4 | Float |
| 28 | sim_hour | 1 | 1 | Integer |
| 29 | sim_min | 1 | 1 | Integer |
| 30 | sim_molpct | 16 | 4 | Float |
| 31 | sim_month | 1 | 1 | Integer |
| 32 | sim_newdata | 1 | 1 | Integer |
| 33 | sim_rden_gas | 1 | 1 | Float |
| 34 | sim_rf | 16 | 4 | Float |
| 35 | sim_sbtu | 1 | 1 | Float |
| 36 | sim_smask | 1 | 1 | Integer |
| 37 | sim_stream | 1 | 1 | Integer |
| 38 | sim_totgpm | 1 | 1 | Float |
| 39 | sim_unnormal | 1 | 1 | Float |
| 40 | sim_wobbe | 1 | 1 | Float |
| 41 | sim_year | 1 | 1 | Integer |

**********

Streams Data Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

| No. | Structure Name | No. of Streams |
|---|---|---|

No entries found.

**********

Component Data Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

| No. | Structure Name | No. of Streams | No. of Components per Stream |
|---|---|---|---|

No entries found.

**********

Data Files Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

| No. | File Name | No. of Records |
|---|---|---|
| 1 | Event_Log | 240 |

File Name Event_Log

| No. | Field Name | Type | No. of Chars. |
|---|---|---|---|
| 1 | date | Float | |
| 2 | time | Float | |
| 3 | operator_id | Char | 4 |
| 4 | event_id | Float | |
| 5 | ASCII_text | Char | 60 |
| 6 | prev_value | Float | |
| 7 | curr_value | Float | |

**********

Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

| No. | Name | Page Width | Page Length | Left Margin | Right Margin | Top Margin | Bottom Margin |
|---|---|---|---|---|---|---|---|
| 1 | Analysis | 150 | 55 | 0 | 0 | 0 | 0 |
| 2 | Raw Data | 80 | 55 | 1 | 0 | 0 | 0 |
| 3 | Calibration | 80 | 55 | 1 | 0 | 0 | 0 |
| 4 | Final Calib | 80 | 55 | 1 | 0 | 0 | 0 |
| 5 | Hourly Avg | 80 | 55 | 0 | 0 | 0 | 0 |
| 6 | 24 Hour Avg | 80 | 55 | 0 | 0 | 0 | 0 |
| 7 | Weekly Avg | 80 | 55 | 0 | 0 | 0 | 0 |
| 8 | Monthly Avg | 80 | 55 | 0 | 0 | 0 | 0 |
| 9 | Variable Avg | 80 | 55 | 0 | 0 | 0 | 0 |

Field List used in Analysis

| Type | Variable | SubField Name | Indices | CP | Flag |
|---|---|---|---|---|---|
| STRING | | | | 0 | |
| STRING | | | | 0 | |
| DATE | | | | | |
| DATE | | | | | |
| STRING | | | | 0 | |
| VARIABLE | stream_data | anly_time | STREAM_NO 1 | 0 | |
| STRING | | | | 0 | |
| VARIABLE | stream_data | cycl_time | STREAM_NO 1 | 0 | |
| STRING | | | | 0 | |
| VARIABLE | stream_data | stream_num | STREAM_NO 1 | 0 | |
| VARIABLE | strms | name | STREAM_NO 1 | 0 | |
| STRING | | | | 0 | |
| VARIABLE | stream_data | run_mode | STREAM_NO 1 | 0 | |

```
STRING                                                              0
TIME VAR stream_data   cycl_strt_tm   STREAM_NO          1          0
STRING                                                              0
VARIABLE anlyzr_name                       1          1          0
STRING                                                              0
VARIABLE seqtxt                         DET NO          1          0
VARIABLE rpt_header1                       1          1          0
VARIABLE rpt_header2                       1          1          0
TABLE                                                               2
  TVAR   cdt           stdusr        CDT_TBL_NO         1*         0
  TVAR   cdt           compnam       CDT_TBL_NO         1*         0
  TVAR   analysis      molpct         STREAM_NO         1*        25
  TVAR   analysis      wtpct          STREAM_NO         1*        26
  TVAR   analysis      liqvolpct      STREAM_NO         1*        27
  TVAR   analysis      gpm            STREAM_NO         1*        28
  TVAR   analysis      btu_gross      STREAM_NO         1*        29
  TVAR   analysis      btu_net        STREAM_NO         1*        30
  TVAR   analysis      rel_den_gas    STREAM_NO         1*        31
  TVAR   analysis      superior_m3    STREAM_NO         1*        54
  TVAR   analysis      inferior_m3    STREAM_NO         1*        55
  TVAR   analysis      superior_kg    STREAM_NO         1*        56
  TVAR   analysis      inferior_kg    STREAM_NO         1*        57
STRING                                                              0
VARIABLE stream_data   totl_mole      STREAM_NO          1          0
VARIABLE stream_data   totl_molwgt    STREAM_NO          1          0
VARIABLE stream_data   totl_liqvol    STREAM_NO          1          0
VARIABLE stream_data   totl_gpmc2     STREAM_NO          1          0
VARIABLE stream_data   totl_btugros   STREAM_NO          1          0
VARIABLE stream_data   totl_btu_net   STREAM_NO          1          0
VARIABLE stream_data   totl_rd_gas    STREAM_NO          1          0
VARIABLE stream_data   totl_sm3_dry   STREAM_NO          1          0
VARIABLE stream_data   totl_im3_dry   STREAM_NO          1          0
VARIABLE stream_data   totl_skg_dry   STREAM_NO          1          0
```

```
VARIABLE stream_data   totl_ikg_dry   STREAM_NO          1          0
STRING                                                             0
STRING                                                            32
VARIABLE strms         base_pres      STREAM_NO          1          0
STRING                                                           250
STRING                                                           251
VARIABLE strms         base_temp      STREAM_NO          1          0
STRING                                                            32
STRING                                                           250
STRING                                                           251
STRING                                                            32
VARIABLE stream_data   z_factor       STREAM_NO          1          0
STRING                                                             0
VARIABLE strms         base_pres      STREAM_NO          1          0
VARIABLE op_pressures                 STREAM_NO          1          0
VARIABLE op_pressures                 STREAM_NO          2          0
VARIABLE op_pressures                 STREAM_NO          3          0
STRING                                                             0
STRING                                                            81
STRING                                                            82
STRING                                                            83
STRING                                                            29
STRING                                                            29
VARIABLE stream_data   btudry_gross   STREAM_NO          1          0
VARIABLE op_pres_calc                 STREAM_NO          1          0
VARIABLE op_pres_calc                 STREAM_NO         13          0
VARIABLE op_pres_calc                 STREAM_NO         25          0
STRING                                                            43
STRING                                                            39
STRING                                                            39
VARIABLE stream_data   btusat_gross   STREAM_NO          1          0
VARIABLE op_pres_calc                 STREAM_NO          2          0
VARIABLE op_pres_calc                 STREAM_NO         14          0
```

```
VARIABLE op_pres_calc                STREAM_NO        26          0
STRING                                                            44
STRING                                                            40
STRING                                                            40
VARIABLE stream_data   btuact_gross  STREAM_NO         1          0
VARIABLE op_pres_calc                STREAM_NO         3          0
VARIABLE op_pres_calc                STREAM_NO        15          0
VARIABLE op_pres_calc                STREAM_NO        27          0
STRING                                                            52
STRING                                                            30
STRING                                                            30
VARIABLE stream_data   btu_dry_net   STREAM_NO         1          0
VARIABLE op_pres_calc                STREAM_NO         4          0
VARIABLE op_pres_calc                STREAM_NO        16          0
VARIABLE op_pres_calc                STREAM_NO        28          0
STRING                                                            45
STRING                                                            41
STRING                                                            41
VARIABLE stream_data   btu_sat_net   STREAM_NO         1          0
VARIABLE op_pres_calc                STREAM_NO         5          0
VARIABLE op_pres_calc                STREAM_NO        17          0
VARIABLE op_pres_calc                STREAM_NO        29          0
STRING                                                            46
STRING                                                            42
STRING                                                            42
VARIABLE stream_data   btu_act_net   STREAM_NO         1          0
VARIABLE op_pres_calc                STREAM_NO         6          0
VARIABLE op_pres_calc                STREAM_NO        18          0
VARIABLE op_pres_calc                STREAM_NO        30          0
STRING                                                            53
STRING                                                            47
VARIABLE stream_data   totl_gpmc2    STREAM_NO         1          0
VARIABLE op_pres_calc                STREAM_NO         8          0
```

```
VARIABLE op_pres_calc                STREAM_NO         20          0
VARIABLE op_pres_calc                STREAM_NO         32          0
STRING                                                             48
VARIABLE stream_data   totl_gpmc3    STREAM_NO          1          0
VARIABLE op_pres_calc                STREAM_NO          9          0
VARIABLE op_pres_calc                STREAM_NO         21          0
VARIABLE op_pres_calc                STREAM_NO         33          0
STRING                                                             49
VARIABLE stream_data   totl_gpmc4    STREAM_NO          1          0
VARIABLE op_pres_calc                STREAM_NO         10          0
VARIABLE op_pres_calc                STREAM_NO         22          0
VARIABLE op_pres_calc                STREAM_NO         34          0
STRING                                                             50
VARIABLE stream_data   totl_gpmc5    STREAM_NO          1          0
VARIABLE op_pres_calc                STREAM_NO         11          0
VARIABLE op_pres_calc                STREAM_NO         23          0
VARIABLE op_pres_calc                STREAM_NO         35          0
STRING                                                             51
VARIABLE stream_data   totl_gpmc6    STREAM_NO          1          0
VARIABLE op_pres_calc                STREAM_NO         12          0
VARIABLE op_pres_calc                STREAM_NO         24          0
VARIABLE op_pres_calc                STREAM_NO         36          0
STRING                                                             59
VARIABLE stream_data   sup_m3_dry    STREAM_NO          1          0
VARIABLE op_pres_calc                STREAM_NO          1          0
VARIABLE op_pres_calc                STREAM_NO         13          0
VARIABLE op_pres_calc                STREAM_NO         25          0
STRING                                                            156
STRING                                                             60
VARIABLE stream_data   sup_m3_sat    STREAM_NO          1          0
VARIABLE op_pres_calc                STREAM_NO          2          0
VARIABLE op_pres_calc                STREAM_NO         14          0
VARIABLE op_pres_calc                STREAM_NO         26          0
```

```
STRING                                                    157
STRING                                                     61
VARIABLE stream_data   sup_m3_act     STREAM_NO          1    0
VARIABLE op_pres_calc                 STREAM_NO          3    0
VARIABLE op_pres_calc                 STREAM_NO         15    0
VARIABLE op_pres_calc                 STREAM_NO         28    0
STRING                                                    158
STRING                                                     62
VARIABLE stream_data   inf_m3_dry     STREAM_NO          1    0
VARIABLE op_pres_calc                 STREAM_NO          4    0
VARIABLE op_pres_calc                 STREAM_NO         16    0
VARIABLE op_pres_calc                 STREAM_NO         28    0
STRING                                                    159
STRING                                                     63
VARIABLE stream_data   inf_m3_sat     STREAM_NO          1    0
VARIABLE op_pres_calc                 STREAM_NO          5    0
VARIABLE op_pres_calc                 STREAM_NO         17    0
VARIABLE op_pres_calc                 STREAM_NO         29    0
STRING                                                    181
STRING                                                     64
VARIABLE stream_data   inf_m3_act     STREAM_NO          1    0
VARIABLE op_pres_calc                 STREAM_NO          6    0
VARIABLE op_pres_calc                 STREAM_NO         18    0
VARIABLE op_pres_calc                 STREAM_NO         30    0
STRING                                                    182
STRING                                                     65
VARIABLE stream_data   sup_kg_dry     STREAM_NO          1    0
STRING                                                    182
STRING                                                     66
VARIABLE stream_data   inf_kg_dry     STREAM_NO          1    0
STRING                                                    184
STRING                                                     67
VARIABLE stream_data   sdry_kcal_m3   STREAM_NO          1    0
```

```
VARIABLE op_pres_calc                STREAM_NO          9          0
VARIABLE op_pres_calc                STREAM_NO         21          0
VARIABLE op_pres_calc                STREAM_NO         33          0
STRING                                                            185
STRING                                                             68
VARIABLE stream_data   ssat_kcal_m3  STREAM_NO          1          0
VARIABLE op_pres_calc                STREAM_NO          7          0
VARIABLE op_pres_calc                STREAM_NO         19          0
VARIABLE op_pres_calc                STREAM_NO         31          0
STRING                                                            186
STRING                                                             69
VARIABLE stream_data   sact_kcal_m3  STREAM_NO          1          0
VARIABLE op_pres_calc                STREAM_NO          8          0
VARIABLE op_pres_calc                STREAM_NO         20          0
VARIABLE op_pres_calc                STREAM_NO         32          0
STRING                                                            187
STRING                                                             70
VARIABLE stream_data   idry_kcal_m3  STREAM_NO          1          0
VARIABLE op_pres_calc                STREAM_NO         10          0
VARIABLE op_pres_calc                STREAM_NO         22          0
VARIABLE op_pres_calc                STREAM_NO         34          0
STRING                                                            188
STRING                                                             71
VARIABLE stream_data   isat_kcal_m3  STREAM_NO          1          0
VARIABLE op_pres_calc                STREAM_NO         11          0
VARIABLE op_pres_calc                STREAM_NO         23          0
VARIABLE op_pres_calc                STREAM_NO         35          0
STRING                                                            189
STRING                                                             72
VARIABLE stream_data   iact_kcal_m3  STREAM_NO          1          0
VARIABLE op_pres_calc                STREAM_NO         12          0
VARIABLE op_pres_calc                STREAM_NO         24          0
VARIABLE op_pres_calc                STREAM_NO         36          0
```

```
STRING                                                          190
STRING                                                           73
VARIABLE stream_data   sdry_kcal_kg   STREAM_NO          1       0
STRING                                                          191
STRING                                                           74
VARIABLE stream_data   idry_kcal_kg   STREAM_NO          1       0
STRING                                                          192
STRING                                                           31
VARIABLE stream_data   real_rd_gas    STREAM_NO          1       0
STRING                                                           34
VARIABLE stream_data   real_rd_lqd    STREAM_NO          1       0
STRING                                                           58
VARIABLE stream_data   rden_lqd_15    STREAM_NO          1       0
STRING                                                           58
STRING                                                           33
VARIABLE stream_data   totl_unrml     STREAM_NO          1       0
STRING                                                           77
VARIABLE stream_data   avg_molwgt     STREAM_NO          1       0
STRING                                                           35
STRING                                                           35
VARIABLE stream_data   wobbe          STREAM_NO          1       0
STRING                                                           36
STRING                                                           36
VARIABLE stream_data   gas_density    STREAM_NO          1       0
STRING                                                           36
STRING                                                           75
VARIABLE stream_data   gas_dens_m3    STREAM_NO          1       0
STRING                                                           75
STRING                                                           37
VARIABLE stream_data   lqd_density    STREAM_NO          1       0
STRING                                                           37
STRING                                                           76
VARIABLE stream_data   lqd_dens_m3    STREAM_NO          1       0
```

```
 STRING                                                          76
 STRING                                                          38
 VARIABLE stream_data   reid_vapor     STREAM_NO          1       0
 STRING                                                          38
 TABLE                                                          200
   TVAR   anlin         label                1*          1       0
   TVAR   aincur                             1*          1       0
 STRING                                                         160
 TABLE                                                          160
   TVAR   calcs         label                1*          1       0
   TVAR   calcval                            1*          1       0

 * indicates index is incremented.
 Field List used in Raw Data
---------------------------------

 Type            Variable SubField Name         Indices           CP Flag
-------------------------------------------------------------------------
 STRING                                                          0
 STRING                                                          0
 DATE
 DATE
 STRING                                                          0
 VARIABLE stream_data   anly_time      STREAM_NO          1       0
 STRING                                                          0
 VARIABLE stream_data   cycl_time      STREAM_NO          1       0
 STRING                                                          0
 VARIABLE stream_data   stream_num     STREAM_NO          1       0
 VARIABLE strms         name           STREAM_NO          1       0
 STRING                                                          0
 VARIABLE stream_data   run_mode       STREAM_NO          1       0
 STRING                                                          0
 TIME VAR stream_data   cycl_strt_tm   STREAM_NO          1       0
 STRING                                                          0
```

```
 VARIABLE anlyzr_name                          1          1          0
 STRING                                                              0
 VARIABLE seqtxt                           DET NO         1          0
 VARIABLE rpt_header1                          1          1          0
 VARIABLE rpt_header2                          1          1          0
 TABLE                                                              50
   TVAR   raw_data      peak_num       STREAM_NO         1*         21
   TVAR   raw_data      rt             STREAM_NO         1*         21
   TVAR   raw_data      area           STREAM_NO         1*         21
   TVAR   raw_data      height         STREAM_NO         1*         21
   TVAR   raw_data      detector       STREAM_NO         1*         21
   TVAR   raw_data2     method         STREAM_NO         1*         21
   TVAR   raw_data3     startint       STREAM_NO         1*         21
   TVAR   raw_data3     endint         STREAM_NO         1*         21
   TVAR   raw_data3     half_height    STREAM_NO         1*         21

 * indicates index is incremented.
 Field List used in Calibration
--------------------------------

 Type            Variable SubField Name         Indices           CP Flag
-------------------------------------------------------------------------
 STRING                                                              0
 STRING                                                              0
 VARIABLE cal_run_num                          1          1          0
 STRING                                                              0
 VARIABLE strms        nrun           STREAM_NO         1          0
 STRING                                                              0
 DATE
 DATE
 STRING                                                              0
 VARIABLE stream_data  anly_time      STREAM_NO         1          0
 STRING                                                              0
 VARIABLE stream_data  cycl_time      STREAM_NO         1          0
```

```
STRING                                                          0
VARIABLE stream_data   stream_num     STREAM_NO          1     0
VARIABLE strms         name           STREAM_NO          1     0
STRING                                                          0
VARIABLE stream_data   run_mode       STREAM_NO          1     0
STRING                                                          0
TIME VAR stream_data   cycl_strt_tm   STREAM_NO          1     0
STRING                                                          0
VARIABLE anlyzr_name                        1          1     0
STRING                                                          0
VARIABLE seqtxt                          DET NO        1     0
VARIABLE rpt_header1                        1          1     0
VARIABLE rpt_header2                        1          1     0
TABLE                                                           2
  TVAR   cdt           compnam       CDT_TBL_NO       1*     0
  TVAR   cdt           cal_conc      CDT_TBL_NO       1*     0
  TVAR   cal_avgs      raw            STREAM_NO       1*     0
  TVAR   cal_avgs      rf             STREAM_NO       1*     0
  TVAR   cal_avgs      rfdev          STREAM_NO       1*     0
  TVAR   cal_avgs      rt             STREAM_NO       1*     0
  TVAR   cal_avgs      rtdev          STREAM_NO       1*     0
ALARMS                                                          0
```

* indicates index is incremented.

Field List used in Final Calib

---

| Type | Variable | SubField Name | Indices | | CP Flag |
|---|---|---|---|---|---|
| STRING | | | | | 0 |
| STRING | | | | | 0 |
| DATE | | | | | |
| DATE | | | | | |
| STRING | | | | | 0 |
| VARIABLE | stream_data | anly_time | STREAM_NO | 1 | 0 |
| STRING | | | | | 0 |
| VARIABLE | stream_data | cycl_time | STREAM_NO | 1 | 0 |
| STRING | | | | | 0 |
| VARIABLE | stream_data | stream_num | STREAM_NO | 1 | 0 |
| VARIABLE | strms | name | STREAM_NO | 1 | 0 |
| STRING | | | | | 0 |
| VARIABLE | stream_data | run_mode | STREAM_NO | 1 | 0 |
| STRING | | | | | 0 |
| TIME VAR | stream_data | cycl_strt_tm | STREAM_NO | 1 | 0 |
| STRING | | | | | 0 |
| VARIABLE | anlyzr_name | | 1 | 1 | 0 |
| STRING | | | | | 0 |
| VARIABLE | seqtxt | | DET NO | 1 | 0 |
| VARIABLE | rpt_header1 | | 1 | 1 | 0 |
| VARIABLE | rpt_header2 | | 1 | 1 | 0 |
| TABLE | | | | | 2 |
| TVAR | cdt | compnam | CDT_TBL_NO | 1* | 0 |
| TVAR | cdt | cal_conc | CDT_TBL_NO | 1* | 0 |
| TVAR | cal_results | oldrf | STREAM_NO | 1* | 0 |
| TVAR | cal_results | newrf | STREAM_NO | 1* | 0 |
| TVAR | cal_results | updated | STREAM_NO | 1* | 0 |

| | | | | | |
|---|---|---|---|---|---|
| TVAR | cal_results | rfdev | STREAM_NO | 1* | 0 |
| TVAR | cal_results | oldrt | STREAM_NO | 1* | 0 |
| TVAR | cal_results | newrt | STREAM_NO | 1* | 0 |
| TVAR | cal_results | updated | STREAM_NO | 1* | 0 |
| TVAR | cal_results | rtdev | STREAM_NO | 1* | 0 |
| ALARMS | | | | | 0 |

* indicates index is incremented.

Field List used in Hourly Avg

| Type | Variable | SubField Name | Indices | | CP Flag |
|---|---|---|---|---|---|
| STRING | | | | | 0 |
| STRING | | | | | 0 |
| VARIABLE | anlyzr_name | | 1 | 1 | 0 |
| VARIABLE | rpt_header1 | | 1 | 1 | 0 |
| VARIABLE | rpt_header2 | | 1 | 1 | 0 |
| VARIABLE | avg_data | number | 1* | 1 | 0 |
| VARIABLE | avg_data | label | 1* | 1 | 0 |
| STRING | | | | | 0 |
| VARIABLE | avg_data | s | 1* | 1 | 0 |
| STRING | | | | | 129 |
| VARIABLE | avg_data | c | 1* | 1 | 0 |
| STRING | | | | | 0 |
| STRING | | | | | 0 |
| STRING | | | | | 0 |
| STRING | | | | | 0 |
| STRING | | | | | 0 |
| STRING | | | | | 0 |
| STRING | | | | | 0 |
| VARIABLE | avg_archive1 | avg | 1* | 1 | 0 |
| VARIABLE | avg_archive1 | minimum | 1* | 1 | 0 |
| VARIABLE | avg_archive1 | maximum | 1* | 1 | 0 |

```
 VARIABLE avg_archive2                        1*          1          0
 STRING                                                              0
 VARIABLE avg_archive1  avg                   1*          2          0
 VARIABLE avg_archive1  minimum               1*          2          0
 VARIABLE avg_archive1  maximum               1*          2          0
 VARIABLE avg_archive2                        1*          2          0
 STRING                                                              0
 VARIABLE avg_archive1  avg                   1*          3          0
 VARIABLE avg_archive1  minimum               1*          3          0
 VARIABLE avg_archive1  maximum               1*          3          0
 VARIABLE avg_archive2                        1*          3          0

 * indicates index is incremented.
 Field List used in 24 Hour Avg
---------------------------------

 Type            Variable SubField Name         Indices           CP Flag
-------------------------------------------------------------------------
 STRING                                                              0
 STRING                                                              0
 VARIABLE anlyzr_name                         1           1          0
 VARIABLE rpt_header1                         1           1          0
 VARIABLE rpt_header2                         1           1          0
 VARIABLE avg_data      number                1*          1          0
 VARIABLE avg_data      label                 1*          1          0
 STRING                                                              0
 VARIABLE avg_data      s                     1*          1          0
 STRING                                                            129
 VARIABLE avg_data      c                     1*          1          0
 STRING                                                              0
 STRING                                                              0
 STRING                                                              0
 STRING                                                              0
 STRING                                                              0
```

```
 STRING                                                          0
 STRING                                                          0
 VARIABLE avg_archive1  avg                 1*          1        0
 VARIABLE avg_archive1  minimum             1*          1        0
 VARIABLE avg_archive1  maximum             1*          1        0
 VARIABLE avg_archive2                      1*          1        0
 STRING                                                          0
 VARIABLE avg_archive1  avg                 1*          2        0
 VARIABLE avg_archive1  minimum             1*          2        0
 VARIABLE avg_archive1  maximum             1*          2        0
 VARIABLE avg_archive2                      1*          2        0
 STRING                                                          0
 VARIABLE avg_archive1  avg                 1*          3        0
 VARIABLE avg_archive1  minimum             1*          3        0
 VARIABLE avg_archive1  maximum             1*          3        0
 VARIABLE avg_archive2                      1*          3        0

 * indicates index is incremented.
 Field List used in Weekly Avg
---------------------------------


 Type            Variable SubField Name         Indices           CP Flag
-------------------------------------------------------------------------
 STRING                                                          0
 STRING                                                          0
 VARIABLE anlyzr_name                       1           1        0
 VARIABLE rpt_header1                       1           1        0
 VARIABLE rpt_header2                       1           1        0
 VARIABLE avg_data      number              1*          1        0
 VARIABLE avg_data      label               1*          1        0
 STRING                                                          0
 VARIABLE avg_data      s                   1*          1        0
 STRING                                                        129
```

```
 VARIABLE avg_data      c                    1*          1          0
 STRING                                                             0
 STRING                                                             0
 STRING                                                             0
 STRING                                                             0
 STRING                                                             0
 STRING                                                             0
 STRING                                                             0
 VARIABLE avg_archive1  avg                  1*          1          0
 VARIABLE avg_archive1  minimum              1*          1          0
 VARIABLE avg_archive1  maximum              1*          1          0
 VARIABLE avg_archive2                       1*          1          0
 STRING                                                             0
 VARIABLE avg_archive1  avg                  1*          2          0
 VARIABLE avg_archive1  minimum              1*          2          0
 VARIABLE avg_archive1  maximum              1*          2          0
 VARIABLE avg_archive2                       1*          2          0
 STRING                                                             0
 VARIABLE avg_archive1  avg                  1*          3          0
 VARIABLE avg_archive1  minimum              1*          3          0
 VARIABLE avg_archive1  maximum              1*          3          0
 VARIABLE avg_archive2                       1*          3          0

 * indicates index is incremented.
 Field List used in Monthly Avg
---------------------------------

 Type            Variable SubField Name         Indices           CP Flag
-------------------------------------------------------------------------
 STRING                                                             0
 STRING                                                             0
 VARIABLE anlyzr_name                        1           1          0
 VARIABLE rpt_header1                        1           1          0
 VARIABLE rpt_header2                        1           1          0
```

```
 VARIABLE avg_data      number               1*          1          0
 VARIABLE avg_data      label                1*          1          0
 STRING                                                             0
 VARIABLE avg_data      s                    1*          1          0
 STRING                                                           129
 VARIABLE avg_data      c                    1*          1          0
 STRING                                                             0
 STRING                                                             0
 STRING                                                             0
 STRING                                                             0
 STRING                                                             0
 STRING                                                             0
 STRING                                                             0
 VARIABLE avg_archive1  avg                  1*          1          0
 VARIABLE avg_archive1  minimum              1*          1          0
 VARIABLE avg_archive1  maximum              1*          1          0
 VARIABLE avg_archive2                       1*          1          0
 STRING                                                             0
 VARIABLE avg_archive1  avg                  1*          2          0
 VARIABLE avg_archive1  minimum              1*          2          0
 VARIABLE avg_archive1  maximum              1*          2          0
 VARIABLE avg_archive2                       1*          2          0
 STRING                                                             0
 VARIABLE avg_archive1  avg                  1*          3          0
 VARIABLE avg_archive1  minimum              1*          3          0
 VARIABLE avg_archive1  maximum              1*          3          0
 VARIABLE avg_archive2                       1*          3          0

 * indicates index is incremented.
 Field List used in Variable Avg
---------------------------------
```

| Type | Variable | SubField Name | Indices | | CP Flag |
|---|---|---|---|---|---|
| STRING | | | | | 0 |
| STRING | | | | | 0 |
| VARIABLE | anlyzr_name | | 1 | 1 | 0 |
| VARIABLE | rpt_header1 | | 1 | 1 | 0 |
| VARIABLE | rpt_header2 | | 1 | 1 | 0 |
| VARIABLE | avg_data | number | 1* | 1 | 0 |
| VARIABLE | avg_data | label | 1* | 1 | 0 |
| STRING | | | | | 0 |
| VARIABLE | avg_data | s | 1* | 1 | 0 |
| STRING | | | | | 129 |
| VARIABLE | avg_data | c | 1* | 1 | 0 |
| STRING | | | | | 0 |
| STRING | | | | | 0 |
| STRING | | | | | 0 |
| STRING | | | | | 0 |
| STRING | | | | | 0 |
| STRING | | | | | 0 |
| STRING | | | | | 0 |
| VARIABLE | avg_archive1 | avg | 1* | 1 | 0 |
| VARIABLE | avg_archive1 | minimum | 1* | 1 | 0 |
| VARIABLE | avg_archive1 | maximum | 1* | 1 | 0 |
| VARIABLE | avg_archive2 | | 1* | 1 | 0 |
| STRING | | | | | 0 |
| VARIABLE | avg_archive1 | avg | 1* | 2 | 0 |
| VARIABLE | avg_archive1 | minimum | 1* | 2 | 0 |
| VARIABLE | avg_archive1 | maximum | 1* | 2 | 0 |
| VARIABLE | avg_archive2 | | 1* | 2 | 0 |
| STRING | | | | | 0 |
| VARIABLE | avg_archive1 | avg | 1* | 3 | 0 |
| VARIABLE | avg_archive1 | minimum | 1* | 3 | 0 |
| VARIABLE | avg_archive1 | maximum | 1* | 3 | 0 |
| VARIABLE | avg_archive2 | | 1* | 3 | 0 |

* indicates index is incremented.

**********

Communication Report from 2350_001 2350_001.BIN

6/2/2000 15:02:49

| Slave Name | Slave ID | Slave Type |
|---|---|---|
| USER_MODBUS | 0 | PLC Emulation - Low-Hi |
| SIM_2251 | 3 | Daniel 2500 Emulation |

USER_MODBUS

| Modbus Reg. | Variable Name | Field Name | Indices S | Indices C | Data Type | String Length | Override Keylock? |
|---|---|---|---|---|---|---|---|
| Boolean(Coils) | | | | | | | |
| 0 | sysalarm_set | | 1 | 1 | Application Checksum Failure | | No |
| 1 | sysalarm_set | | 2 | 1 | ROM Checksum Failure | | No |
| 2 | sysalarm_set | | 3 | 1 | RAM Diagnostics Failure | | No |
| 3 | sysalarm_set | | 4 | 1 | A/D Converter Failure | | No |
| 4 | sysalarm_set | | 5 | 1 | Detector Oven Failure | | No |
| 5 | sysalarm_set | | 6 | 1 | Liquid Sample Valve Heater Failure | | No |
| 6 | sysalarm_set | | 7 | 1 | Sample System Oven Failure | | No |
| 7 | sysalarm_set | | 8 | 1 | Catalytic Converter Failure | | No |
| 8 | sysalarm_set | | 9 | 1 | Heater 5 Failure | | No |
| 9 | sysalarm_set | | 10 | 1 | Heater 6 Failure | | No |
| 10 | sysalarm_set | | 11 | 1 | Heater 1 Controller Failure | | No |
| 11 | sysalarm_set | | 12 | 1 | Heater 2 Controller Failure | | No |
| 12 | sysalarm_set | | 13 | 1 | Heater 3 Controller Failure | | No |
| 13 | sysalarm_set | | 14 | 1 | Heater 4 Controller Failure | | No |
| 14 | sysalarm_set | | 15 | 1 | Heater 5 Controller Failure | | No |
| 15 | sysalarm_set | | 16 | 1 | Heater 6 Controller Failure | | No |
| 16 | sysalarm_set | | 17 | 1 | FID Flame out | | No |
| 17 | sysalarm_set | | 18 | 1 | Warmstart Calibration Failure | | No |

| | | | | | |
|---|---|---|---|---|---|
| 18 | sysalarm_set | 19 | 1 | Valve Timing Failure | No |
| 19 | sysalarm_set | 20 | 1 | Excess Response Factor Deviation | No |
| 20 | sysalarm_set | 21 | 1 | M200 Invalid Non-Volatile Data | No |
| 21 | sysalarm_set | 22 | 1 | M200 Invalid A Module Data | No |
| 22 | sysalarm_set | 23 | 1 | M200 Invalid B Module Data | No |
| 23 | sysalarm_set | 24 | 1 | M200 Bad Options | No |
| 24 | sysalarm_set | 25 | 1 | M200 Stack Overflow | No |
| 25 | sysalarm_set | 26 | 1 | M200 Hardware Shutdown | No |
| 26 | sysalarm_set | 27 | 1 | M200 Synchronization Failure | No |
| 27 | sysalarm_set | 28 | 1 | Preamp Input 1 Out of Range - DET1 | No |
| 28 | sysalarm_set | 29 | 1 | Preamp Input 2 Out of Range - DET1 | No |
| 29 | sysalarm_set | 30 | 1 | Preamp Input 3 Out of Range - DET1 | No |
| 30 | sysalarm_set | 31 | 1 | Preamp Input 4 Out of Range - DET1 | No |
| 31 | sysalarm_set | 32 | 1 | Preamp Failure - DET1 | No |
| 32 | sysalarm_set | 33 | 1 | Analog Output 1 HIGH | No |
| 33 | sysalarm_set | 34 | 1 | Analog Output 2 HIGH | No |
| 34 | sysalarm_set | 35 | 1 | Analog Output 3 HIGH | No |
| 35 | sysalarm_set | 36 | 1 | Analog Output 4 HIGH | No |
| 36 | sysalarm_set | 37 | 1 | Analog Output 5 HIGH | No |
| 37 | sysalarm_set | 38 | 1 | Analog Output 6 HIGH | No |
| 38 | sysalarm_set | 39 | 1 | Analog Output 7 HIGH | No |
| 39 | sysalarm_set | 40 | 1 | Analog Output 8 HIGH | No |
| 40 | sysalarm_set | 41 | 1 | Analog Output 9 HIGH | No |
| 41 | sysalarm_set | 42 | 1 | Analog Output 10 HIGH | No |
| 42 | sysalarm_set | 43 | 1 | Analog Output 11 HIGH | No |
| 43 | sysalarm_set | 44 | 1 | Analog Output 12 HIGH | No |
| 44 | sysalarm_set | 45 | 1 | Analog Output 13 HIGH | No |
| 45 | sysalarm_set | 46 | 1 | Analog Output 14 HIGH | No |
| 46 | sysalarm_set | 47 | 1 | Analog Output 15 HIGH | No |
| 47 | sysalarm_set | 48 | 1 | Analog Output 16 HIGH | No |
| 48 | sysalarm_set | 49 | 1 | Analog Output 1 LOW | No |
| 49 | sysalarm_set | 50 | 1 | Analog Output 2 LOW | No |
| 50 | sysalarm_set | 51 | 1 | Analog Output 3 LOW | No |

| | | | | | |
|---|---|---|---|---|---|
| 51 | sysalarm_set | 52 | 1 | Analog Output 4 LOW | No |
| 52 | sysalarm_set | 53 | 1 | Analog Output 5 LOW | No |
| 53 | sysalarm_set | 54 | 1 | Analog Output 6 LOW | No |
| 54 | sysalarm_set | 55 | 1 | Analog Output 7 LOW | No |
| 55 | sysalarm_set | 56 | 1 | Analog Output 8 LOW | No |
| 56 | sysalarm_set | 57 | 1 | Analog Output 9 LOW | No |
| 57 | sysalarm_set | 58 | 1 | Analog Output 10 LOW | No |
| 58 | sysalarm_set | 59 | 1 | Analog Output 11 LOW | No |
| 59 | sysalarm_set | 60 | 1 | Analog Output 12 LOW | No |
| 60 | sysalarm_set | 61 | 1 | Analog Output 13 LOW | No |
| 61 | sysalarm_set | 62 | 1 | Analog Output 14 LOW | No |
| 62 | sysalarm_set | 63 | 1 | Analog Output 15 LOW | No |
| 63 | sysalarm_set | 64 | 1 | Analog Output 16 LOW | No |
| 64 | sysalarm_set | 65 | 1 | Analyzer Failure | No |
| 65 | sysalarm_set | 66 | 1 | Power Failure | No |
| 66 | sysalarm_set | 67 | 1 | Fused Peak Overflow - Noisy Baseline | No |
| 67 | sysalarm_set | 68 | 1 | CPU Battery Low | No |
| 68 | sysalarm_set | 69 | 1 | GC Idle | No |
| 69 | sysalarm_set | 70 | 1 | Real-Time Clock Failure | No |
| 70 | sysalarm_set | 71 | 1 | Analog Input 1 HIGH | No |
| 71 | sysalarm_set | 72 | 1 | Analog Input 2 HIGH | No |
| 72 | sysalarm_set | 73 | 1 | Analog Input 3 HIGH | No |
| 73 | sysalarm_set | 74 | 1 | Analog Input 4 HIGH | No |
| 74 | sysalarm_set | 75 | 1 | Analog Input 1 LOW | No |
| 75 | sysalarm_set | 76 | 1 | Analog Input 2 LOW | No |
| 76 | sysalarm_set | 77 | 1 | Analog Input 3 LOW | No |
| 77 | sysalarm_set | 78 | 1 | Analog Input 4 LOW | No |
| 78 | sysalarm_set | 79 | 1 | Preamp Input 1 Out of Range - DET2 | No |
| 79 | sysalarm_set | 80 | 1 | Preamp Input 2 Out of Range - DET2 | No |
| 80 | sysalarm_set | 81 | 1 | Preamp Input 3 Out of Range - DET2 | No |
| 81 | sysalarm_set | 82 | 1 | Preamp Input 4 Out of Range - DET2 | No |
| 82 | sysalarm_set | 83 | 1 | Preamp Failure - DET2 | No |
| 83 | sysalarm_set | 84 | 1 | NA | No |

| | | | | | | |
|---|---|---|---|---|---|---|
| 84 | sysalarm_set | | 85 | 1 | NA | No |
| 85 | lmtalarm_set | | 1 | 1 | | No |
| 86 | lmtalarm_set | | 2 | 1 | | No |
| 87 | lmtalarm_set | | 3 | 1 | | No |
| 88 | lmtalarm_set | | 4 | 1 | | No |
| 89 | lmtalarm_set | | 5 | 1 | | No |
| 90 | lmtalarm_set | | 6 | 1 | | No |
| 91 | lmtalarm_set | | 7 | 1 | | No |
| 92 | lmtalarm_set | | 8 | 1 | | No |
| 93 | lmtalarm_set | | 9 | 1 | | No |
| 94 | lmtalarm_set | | 10 | 1 | | No |
| 95 | lmtalarm_set | | 11 | 1 | | No |
| 96 | lmtalarm_set | | 12 | 1 | | No |
| 97 | lmtalarm_set | | 13 | 1 | | No |
| 98 | lmtalarm_set | | 14 | 1 | | No |
| 99 | lmtalarm_set | | 15 | 1 | | No |
| 100 | lmtalarm_set | | 16 | 1 | | No |
| 101 | lmtalarm_set | | 17 | 1 | | No |
| 102 | lmtalarm_set | | 18 | 1 | | No |
| 103 | lmtalarm_set | | 19 | 1 | | No |
| 104 | lmtalarm_set | | 20 | 1 | | No |
| 105 | stream_data | stream_togg | 1 | 1 | Stream 1 | No |
| 106 | stream_data | stream_togg | 2 | 1 | Stream 2 | No |
| 107 | stream_data | stream_togg | 3 | 1 | Stream 3 | No |
| 108 | stream_data | stream_togg | 4 | 1 | Stream 4 | No |
| 109 | stream_data | stream_togg | 5 | 1 | Stream 5 | No |
| 110 | stream_data | stream_togg | 6 | 1 | Stream 6 | No |
| 111 | stream_data | stream_togg | 7 | 1 | Stream 7 | No |
| 112 | stream_data | stream_togg | 8 | 1 | Stream 8 | No |
| 113 | doutcur | | 1 | 1 | | No |
| 114 | doutcur | | 2 | 1 | | No |
| 115 | doutcur | | 3 | 1 | | No |
| 116 | doutcur | | 4 | 1 | | No |
| 117 | doutcur | | 5 | 1 | | No |

Numeric(Registers)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0 | stream_data | avg_molwgt | 1 | 1 | Char | 4 | Stream 1 | No |
| 2 | analysis | molpct | 1 | 1 | Char | 4 | C6+ 47/35/17 | 0 - 1 | No |
| 3 | analysis | molpct | 1 | 2 | Integer | | PROPANE | 0 - 1 | No |
| 4 | analysis | molpct | 1 | 3 | Integer | | i-BUTANE | 0 - 1 | No |
| 5 | analysis | molpct | 1 | 4 | Integer | | n-BUTANE | 0 - 1 | No |
| 6 | analysis | molpct | 1 | 5 | Float | | NEOPENTANE | | No |
| 8 | analysis | molpct | 1 | 6 | Float | | i-PENTANE | | No |
| 10 | analysis | molpct | 1 | 7 | Float | | n-PENTANE | | No |
| 12 | analysis | molpct | 1 | 8 | Float | | NITROGEN | | No |
| 14 | analysis | molpct | 1 | 9 | Float | | METHANE | | No |
| 16 | analysis | molpct | 2 | 9 | Float | | METHANE | | No |
| 18 | analysis | molpct | 3 | 9 | Float | | METHANE | | No |
| 20 | analysis | molpct | 4 | 9 | Float | | METHANE | | No |
| 22 | analysis | molpct | 5 | 9 | Float | | METHANE | | No |
| 24 | analysis | molpct | 5 | 10 | Float | | CARBON DIOXIDE | | No |
| 26 | analysis | molpct | 5 | 11 | Float | | ETHANE | | No |
| 28 | analysis | molpct | 6 | 11 | Float | | ETHANE | | No |
| 30 | analysis | molpct | 7 | 11 | Float | | ETHANE | | No |
| 32 | analysis | molpct | 8 | 11 | Float | | ETHANE | | No |

SIM_2251

| Modbus Reg. | Variable Name | Field Name | Indices S | Indices C | Override Keylock? |
|---|---|---|---|---|---|

Boolean(Coils)

16-Bit Integer

| | | | | |
|---|---|---|---|---|
| 3001 | sim_compno | 1 | 1 | No |
| 3002 | sim_compno | 2 | 1 | No |
| 3003 | sim_compno | 3 | 1 | No |
| 3004 | sim_compno | 4 | 1 | No |
| 3005 | sim_compno | 5 | 1 | No |
| 3006 | sim_compno | 6 | 1 | No |
| 3007 | sim_compno | 7 | 1 | No |
| 3008 | sim_compno | 8 | 1 | No |
| 3009 | sim_compno | 9 | 1 | No |
| 3010 | sim_compno | 10 | 1 | No |
| 3011 | sim_compno | 11 | 1 | No |
| 3012 | sim_compno | 12 | 1 | No |
| 3013 | sim_compno | 13 | 1 | No |
| 3014 | sim_compno | 14 | 1 | No |
| 3015 | sim_compno | 15 | 1 | No |
| 3016 | sim_compno | 16 | 1 | No |
| 3017 | sim_compno | 1 | 1 | No |
| 3018 | sim_compno | 2 | 1 | No |
| 3019 | sim_compno | 3 | 1 | No |
| 3020 | sim_compno | 4 | 1 | No |
| 3021 | sim_compno | 5 | 1 | No |
| 3022 | sim_compno | 6 | 1 | No |
| 3023 | sim_compno | 7 | 1 | No |
| 3024 | sim_compno | 8 | 1 | No |
| 3025 | sim_compno | 9 | 1 | No |
| 3026 | sim_compno | 10 | 1 | No |
| 3027 | sim_compno | 11 | 1 | No |

| | | | | |
|---|---|---|---|---|
| 3028 | sim_compno | 12 | 1 | No |
| 3029 | sim_compno | 13 | 1 | No |
| 3030 | sim_compno | 14 | 1 | No |
| 3031 | sim_compno | 15 | 1 | No |
| 3032 | sim_compno | 16 | 1 | No |
| 3033 | sim_anlytime | 1 | 1 | No |
| 3034 | sim_stream | 1 | 1 | No |
| 3035 | sim_smask | 1 | 1 | No |
| 3036 | sim_month | 1 | 1 | No |
| 3037 | sim_day | 1 | 1 | No |
| 3038 | sim_year | 1 | 1 | No |
| 3039 | sim_hour | 1 | 1 | No |
| 3040 | sim_min | 1 | 1 | No |
| 3041 | sim_cycmonth | 1 | 1 | No |
| 3042 | sim_cycday | 1 | 1 | No |
| 3043 | sim_cycyear | 1 | 1 | No |
| 3044 | sim_cychour | 1 | 1 | No |
| 3045 | sim_cycmin | 1 | 1 | No |
| 3046 | sim_alarm | 1 | 1 | No |
| 3047 | sim_alarm | 2 | 1 | No |
| 3048 | sim_alarm | 3 | 1 | No |
| 3049 | sim_alarm | 4 | 1 | No |
| 3050 | sim_alarm | 5 | 1 | No |
| 3051 | sim_alarm | 6 | 1 | No |
| 3052 | sim_alarm | 7 | 1 | No |
| 3053 | sim_alarm | 8 | 1 | No |
| 3054 | sim_alarm | 9 | 1 | No |
| 3055 | sim_alarm | 10 | 1 | No |
| 3056 | sim_alarm | 11 | 1 | No |
| 3057 | sim_alarm | 12 | 1 | No |
| 3058 | sim_newdata | 1 | 1 | No |
| 3059 | sim_cal | 1 | 1 | No |

32-Bit Integer

| | | | | |
|---|---|---|---|---|
| 5001 | sim_cyctime | 1 | 1 | No |
| 5002 | sim_calcycle | 1 | 1 | No |

Floating-Point

| | | | | |
|---|---|---|---|---|
| 7001 | sim_molpct | 1 | 1 | No |
| 7002 | sim_molpct | 2 | 1 | No |
| 7003 | sim_molpct | 3 | 1 | No |
| 7004 | sim_molpct | 4 | 1 | No |
| 7005 | sim_molpct | 5 | 1 | No |
| 7006 | sim_molpct | 6 | 1 | No |
| 7007 | sim_molpct | 7 | 1 | No |
| 7008 | sim_molpct | 8 | 1 | No |
| 7009 | sim_molpct | 9 | 1 | No |
| 7010 | sim_molpct | 10 | 1 | No |
| 7011 | sim_molpct | 11 | 1 | No |
| 7012 | sim_molpct | 12 | 1 | No |
| 7013 | sim_molpct | 13 | 1 | No |
| 7014 | sim_molpct | 14 | 1 | No |
| 7015 | sim_molpct | 15 | 1 | No |
| 7016 | sim_molpct | 16 | 1 | No |
| 7017 | sim_gpmwt | 1 | 1 | No |
| 7018 | sim_gpmwt | 2 | 1 | No |
| 7019 | sim_gpmwt | 3 | 1 | No |
| 7020 | sim_gpmwt | 4 | 1 | No |
| 7021 | sim_gpmwt | 5 | 1 | No |
| 7022 | sim_gpmwt | 6 | 1 | No |
| 7023 | sim_gpmwt | 7 | 1 | No |
| 7024 | sim_gpmwt | 8 | 1 | No |
| 7025 | sim_gpmwt | 9 | 1 | No |
| 7026 | sim_gpmwt | 10 | 1 | No |
| 7027 | sim_gpmwt | 11 | 1 | No |
| 7028 | sim_gpmwt | 12 | 1 | No |
| 7029 | sim_gpmwt | 13 | 1 | No |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7030 | sim_gpmwt | | 14 | 1 | | No |
| 7031 | sim_gpmwt | | 15 | 1 | | No |
| 7032 | sim_gpmwt | | 16 | 1 | | No |
| 7033 | sim_dbtu | | 1 | 1 | | No |
| 7034 | sim_sbtu | | 1 | 1 | | No |
| 7035 | sim_rden_gas | | 1 | 1 | | No |
| 7036 | sim_compress | | 1 | 1 | | No |
| 7037 | sim_wobbe | | 1 | 1 | | No |
| 7038 | sim_unnormal | | 1 | 1 | | No |
| 7039 | sim_totgpm | | 1 | 1 | | No |
| 7040 | calcval | | 1 | 1 | label 1 | No |
| 7041 | calcval | | 2 | 1 | label 2 | No |
| 7042 | calcval | | 3 | 1 | | No |
| 7043 | calcval | | 4 | 1 | | No |
| 7044 | calcval | | 5 | 1 | | No |
| 7045 | sim_dummy | | 1 | 1 | | No |
| 7046 | sim_dummy | | 1 | 1 | | No |
| 7047 | sim_dummy | | 1 | 1 | | No |
| 7048 | sim_dummy | | 1 | 1 | | No |
| 7049 | sim_dummy | | 1 | 1 | | No |
| 7050 | sim_dummy | | 1 | 1 | | No |
| 7051 | sim_dummy | | 1 | 1 | | No |
| 7052 | sim_dummy | | 1 | 1 | | No |
| 7053 | sim_dummy | | 1 | 1 | | No |
| 7054 | sim_abtu | | 1 | 1 | | No |
| 7055 | avgs | avg | 1 | 1 | Not Used | No |
| 7056 | avgs | avg | 2 | 1 | Not Used | No |
| 7057 | avgs | avg | 3 | 1 | Not Used | No |
| 7058 | avgs | avg | 4 | 1 | Not Used | No |
| 7059 | avgs | avg | 5 | 1 | Not Used | No |
| 7060 | avgs | avg | 6 | 1 | Not Used | No |
| 7061 | avgs | avg | 7 | 1 | Not Used | No |
| 7062 | avgs | avg | 8 | 1 | Not Used | No |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7063 | avgs | avg | 9 | 1 | Not Used | No |
| 7064 | avgs | avg | 10 | 1 | Not Used | No |
| 7065 | avgs | avg | 11 | 1 | Not Used | No |
| 7066 | avgs | avg | 12 | 1 | Not Used | No |
| 7067 | avgs | avg | 13 | 1 | Not Used | No |
| 7068 | avgs | avg | 14 | 1 | Not Used | No |
| 7069 | avgs | avg | 15 | 1 | Not Used | No |
| 7070 | avg_archive1 | avg | 1 | 1 | Not Used | No |
| 7071 | avg_archive1 | avg | 2 | 1 | Not Used | No |
| 7072 | avg_archive1 | avg | 3 | 1 | Not Used | No |
| 7073 | avg_archive1 | avg | 4 | 1 | Not Used | No |
| 7074 | avg_archive1 | avg | 5 | 1 | Not Used | No |
| 7075 | avg_archive1 | avg | 6 | 1 | Not Used | No |
| 7076 | avg_archive1 | avg | 7 | 1 | Not Used | No |
| 7077 | avg_archive1 | avg | 8 | 1 | Not Used | No |
| 7078 | avg_archive1 | avg | 9 | 1 | Not Used | No |
| 7079 | avg_archive1 | avg | 10 | 1 | Not Used | No |
| 7080 | avg_archive1 | avg | 11 | 1 | Not Used | No |
| 7081 | avg_archive1 | avg | 12 | 1 | Not Used | No |
| 7082 | avg_archive1 | avg | 13 | 1 | Not Used | No |
| 7083 | avg_archive1 | avg | 14 | 1 | Not Used | No |
| 7084 | avg_archive1 | avg | 15 | 1 | Not Used | No |
| 7085 | aincur | | 1 | 1 | AI 1 | No |
| 7086 | aincur | | 2 | 1 | | No |
| 7087 | sim_cal_abtu | | 1 | 1 | | No |
| 7088 | sim_cal_dbtu | | 1 | 1 | | No |
| 7089 | sim_cal_sbtu | | 1 | 1 | | No |
| 7090 | sim_cal_wobb | | 1 | 1 | | No |
| 7091 | sim_cal_rden | | 1 | 1 | | No |
| 7092 | sim_cal_comp | | 1 | 1 | | No |
| 7093 | sim_cal_gpm | | 1 | 1 | | No |
| 7094 | sim_cal_unno | | 1 | 1 | | No |
| 7095 | sim_rf | | 1 | 1 | | No |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7096 | sim_rf | | 2 | 1 | | No |
| 7097 | sim_rf | | 3 | 1 | | No |
| 7098 | sim_rf | | 4 | 1 | | No |
| 7099 | sim_rf | | 5 | 1 | | No |
| 7100 | sim_rf | | 6 | 1 | | No |
| 7101 | sim_rf | | 7 | 1 | | No |
| 7102 | sim_rf | | 8 | 1 | | No |
| 7103 | sim_rf | | 9 | 1 | | No |
| 7104 | sim_rf | | 10 | 1 | | No |
| 7105 | sim_rf | | 11 | 1 | | No |
| 7106 | sim_rf | | 12 | 1 | | No |
| 7107 | sim_rf | | 13 | 1 | | No |
| 7108 | sim_rf | | 14 | 1 | | No |
| 7109 | sim_rf | | 15 | 1 | | No |
| 7110 | sim_rf | | 16 | 1 | | No |
| 7111 | sim_rf | | 1 | 1 | | No |
| 7112 | sim_rf | | 2 | 1 | | No |
| 7113 | sim_rf | | 3 | 1 | | No |
| 7114 | sim_rf | | 4 | 1 | | No |
| 7115 | sim_rf | | 5 | 1 | | No |
| 7116 | sim_rf | | 6 | 1 | | No |
| 7117 | sim_rf | | 7 | 1 | | No |
| 7118 | sim_rf | | 8 | 1 | | No |
| 7119 | sim_rf | | 9 | 1 | | No |
| 7120 | sim_rf | | 10 | 1 | | No |
| 7121 | sim_rf | | 11 | 1 | | No |
| 7122 | sim_rf | | 12 | 1 | | No |
| 7123 | sim_rf | | 13 | 1 | | No |
| 7124 | sim_rf | | 14 | 1 | | No |
| 7125 | sim_rf | | 15 | 1 | | No |
| 7126 | sim_rf | | 16 | 1 | | No |
| 7127 | avgs | avg | 1 | 1 | Not Used | No |
| 7128 | avgs | avg | 2 | 1 | Not Used | No |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7129 | avgs | avg | 3 | 1 | Not Used | No |
| 7130 | avgs | avg | 4 | 1 | Not Used | No |
| 7131 | avgs | avg | 5 | 1 | Not Used | No |
| 7132 | avgs | avg | 6 | 1 | Not Used | No |
| 7133 | avgs | avg | 7 | 1 | Not Used | No |
| 7134 | avgs | avg | 8 | 1 | Not Used | No |
| 7135 | avgs | avg | 9 | 1 | Not Used | No |
| 7136 | avgs | avg | 10 | 1 | Not Used | No |
| 7137 | avgs | avg | 11 | 1 | Not Used | No |
| 7138 | avgs | avg | 12 | 1 | Not Used | No |
| 7139 | avgs | avg | 13 | 1 | Not Used | No |
| 7140 | avgs | avg | 14 | 1 | Not Used | No |
| 7141 | avgs | avg | 15 | 1 | Not Used | No |
| 7142 | avgs | avg | 16 | 1 | Not Used | No |
| 7143 | avgs | avg | 17 | 1 | Not Used | No |
| 7144 | avgs | avg | 18 | 1 | Not Used | No |
| 7145 | avgs | avg | 19 | 1 | Not Used | No |
| 7146 | avgs | avg | 20 | 1 | Not Used | No |
| 7147 | avgs | avg | 21 | 1 | Not Used | No |
| 7148 | avgs | avg | 22 | 1 | Not Used | No |
| 7149 | avgs | avg | 23 | 1 | Not Used | No |
| 7150 | avgs | avg | 24 | 1 | Not Used | No |
| 7151 | avgs | avg | 25 | 1 | Not Used | No |
| 7152 | avgs | avg | 26 | 1 | Not Used | No |
| 7153 | avgs | avg | 27 | 1 | Not Used | No |
| 7154 | avgs | avg | 28 | 1 | Not Used | No |
| 7155 | avgs | avg | 29 | 1 | Not Used | No |
| 7156 | avgs | avg | 30 | 1 | Not Used | No |
| 7157 | avgs | avg | 31 | 1 | Not Used | No |
| 7158 | avgs | avg | 32 | 1 | Not Used | No |
| 7159 | avgs | avg | 33 | 1 | Not Used | No |
| 7160 | avgs | avg | 34 | 1 | Not Used | No |
| 7161 | avgs | avg | 35 | 1 | Not Used | No |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7162 | avgs | avg | 36 | 1 | Not Used | No |
| 7163 | avgs | maximum | 1 | 1 | Not Used | No |
| 7164 | avgs | maximum | 2 | 1 | Not Used | No |
| 7165 | avgs | maximum | 3 | 1 | Not Used | No |
| 7166 | avgs | maximum | 4 | 1 | Not Used | No |
| 7167 | avgs | maximum | 5 | 1 | Not Used | No |
| 7168 | avgs | maximum | 6 | 1 | Not Used | No |
| 7169 | avgs | maximum | 7 | 1 | Not Used | No |
| 7170 | avgs | maximum | 8 | 1 | Not Used | No |
| 7171 | avgs | maximum | 9 | 1 | Not Used | No |
| 7172 | avgs | maximum | 10 | 1 | Not Used | No |
| 7173 | avgs | maximum | 11 | 1 | Not Used | No |
| 7174 | avgs | maximum | 12 | 1 | Not Used | No |
| 7175 | avgs | maximum | 13 | 1 | Not Used | No |
| 7176 | avgs | maximum | 14 | 1 | Not Used | No |
| 7177 | avgs | maximum | 15 | 1 | Not Used | No |
| 7178 | avgs | maximum | 16 | 1 | Not Used | No |
| 7179 | avgs | maximum | 17 | 1 | Not Used | No |
| 7180 | avgs | maximum | 18 | 1 | Not Used | No |
| 7181 | avgs | maximum | 19 | 1 | Not Used | No |
| 7182 | avgs | maximum | 20 | 1 | Not Used | No |
| 7183 | avgs | maximum | 21 | 1 | Not Used | No |
| 7184 | avgs | maximum | 22 | 1 | Not Used | No |
| 7185 | avgs | maximum | 23 | 1 | Not Used | No |
| 7186 | avgs | maximum | 24 | 1 | Not Used | No |
| 7187 | avgs | maximum | 25 | 1 | Not Used | No |
| 7188 | avgs | maximum | 26 | 1 | Not Used | No |
| 7189 | avgs | maximum | 27 | 1 | Not Used | No |
| 7190 | avgs | maximum | 28 | 1 | Not Used | No |
| 7191 | avgs | maximum | 29 | 1 | Not Used | No |
| 7192 | avgs | maximum | 30 | 1 | Not Used | No |
| 7193 | avgs | maximum | 31 | 1 | Not Used | No |
| 7194 | avgs | maximum | 32 | 1 | Not Used | No |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7195 | avgs | maximum | 33 | 1 | Not Used | No |
| 7196 | avgs | maximum | 34 | 1 | Not Used | No |
| 7197 | avgs | maximum | 35 | 1 | Not Used | No |
| 7198 | avgs | maximum | 36 | 1 | Not Used | No |
| 7199 | avgs | minimum | 1 | 1 | Not Used | No |
| 7200 | avgs | minimum | 2 | 1 | Not Used | No |
| 7201 | avgs | minimum | 3 | 1 | Not Used | No |
| 7202 | avgs | minimum | 4 | 1 | Not Used | No |
| 7203 | avgs | minimum | 5 | 1 | Not Used | No |
| 7204 | avgs | minimum | 6 | 1 | Not Used | No |
| 7205 | avgs | minimum | 7 | 1 | Not Used | No |
| 7206 | avgs | minimum | 8 | 1 | Not Used | No |
| 7207 | avgs | minimum | 9 | 1 | Not Used | No |
| 7208 | avgs | minimum | 10 | 1 | Not Used | No |
| 7209 | avgs | minimum | 11 | 1 | Not Used | No |
| 7210 | avgs | minimum | 12 | 1 | Not Used | No |
| 7211 | avgs | minimum | 13 | 1 | Not Used | No |
| 7212 | avgs | minimum | 14 | 1 | Not Used | No |
| 7213 | avgs | minimum | 15 | 1 | Not Used | No |
| 7214 | avgs | minimum | 16 | 1 | Not Used | No |
| 7215 | avgs | minimum | 17 | 1 | Not Used | No |
| 7216 | avgs | minimum | 18 | 1 | Not Used | No |
| 7217 | avgs | minimum | 19 | 1 | Not Used | No |
| 7218 | avgs | minimum | 20 | 1 | Not Used | No |
| 7219 | avgs | minimum | 21 | 1 | Not Used | No |
| 7220 | avgs | minimum | 22 | 1 | Not Used | No |
| 7221 | avgs | minimum | 23 | 1 | Not Used | No |
| 7222 | avgs | minimum | 24 | 1 | Not Used | No |
| 7223 | avgs | minimum | 25 | 1 | Not Used | No |
| 7224 | avgs | minimum | 26 | 1 | Not Used | No |
| 7225 | avgs | minimum | 27 | 1 | Not Used | No |
| 7226 | avgs | minimum | 28 | 1 | Not Used | No |
| 7227 | avgs | minimum | 29 | 1 | Not Used | No |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7228 | avgs | minimum | 30 | 1 | Not Used | No |
| 7229 | avgs | minimum | 31 | 1 | Not Used | No |
| 7230 | avgs | minimum | 32 | 1 | Not Used | No |
| 7231 | avgs | minimum | 33 | 1 | Not Used | No |
| 7232 | avgs | minimum | 34 | 1 | Not Used | No |
| 7233 | avgs | minimum | 35 | 1 | Not Used | No |
| 7234 | avgs | minimum | 36 | 1 | Not Used | No |
| 7235 | avg_archive1 | avg | 1 | 1 | Not Used | No |
| 7236 | avg_archive1 | avg | 2 | 1 | Not Used | No |
| 7237 | avg_archive1 | avg | 3 | 1 | Not Used | No |
| 7238 | avg_archive1 | avg | 4 | 1 | Not Used | No |
| 7239 | avg_archive1 | avg | 5 | 1 | Not Used | No |
| 7240 | avg_archive1 | avg | 6 | 1 | Not Used | No |
| 7241 | avg_archive1 | avg | 7 | 1 | Not Used | No |
| 7242 | avg_archive1 | avg | 8 | 1 | Not Used | No |
| 7243 | avg_archive1 | avg | 9 | 1 | Not Used | No |
| 7244 | avg_archive1 | avg | 10 | 1 | Not Used | No |
| 7245 | avg_archive1 | avg | 11 | 1 | Not Used | No |
| 7246 | avg_archive1 | avg | 12 | 1 | Not Used | No |
| 7247 | avg_archive1 | avg | 13 | 1 | Not Used | No |
| 7248 | avg_archive1 | avg | 14 | 1 | Not Used | No |
| 7249 | avg_archive1 | avg | 15 | 1 | Not Used | No |
| 7250 | avg_archive1 | avg | 16 | 1 | Not Used | No |
| 7251 | avg_archive1 | avg | 17 | 1 | Not Used | No |
| 7252 | avg_archive1 | avg | 18 | 1 | Not Used | No |
| 7253 | avg_archive1 | avg | 19 | 1 | Not Used | No |
| 7254 | avg_archive1 | avg | 20 | 1 | Not Used | No |
| 7255 | avg_archive1 | avg | 21 | 1 | Not Used | No |
| 7256 | avg_archive1 | avg | 22 | 1 | Not Used | No |
| 7257 | avg_archive1 | avg | 23 | 1 | Not Used | No |
| 7258 | avg_archive1 | avg | 24 | 1 | Not Used | No |
| 7259 | avg_archive1 | avg | 25 | 1 | Not Used | No |
| 7260 | avg_archive1 | avg | 26 | 1 | Not Used | No |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7261 | avg_archive1 | avg | 27 | 1 | Not Used | No |
| 7262 | avg_archive1 | avg | 28 | 1 | Not Used | No |
| 7263 | avg_archive1 | avg | 29 | 1 | Not Used | No |
| 7264 | avg_archive1 | avg | 30 | 1 | Not Used | No |
| 7265 | avg_archive1 | avg | 31 | 1 | Not Used | No |
| 7266 | avg_archive1 | avg | 32 | 1 | Not Used | No |
| 7267 | avg_archive1 | avg | 33 | 1 | Not Used | No |
| 7268 | avg_archive1 | avg | 34 | 1 | Not Used | No |
| 7269 | avg_archive1 | avg | 35 | 1 | Not Used | No |
| 7270 | avg_archive1 | avg | 36 | 1 | Not Used | No |
| 7271 | avg_archive1 | maximum | 1 | 1 | Not Used | No |
| 7272 | avg_archive1 | maximum | 2 | 1 | Not Used | No |
| 7273 | avg_archive1 | maximum | 3 | 1 | Not Used | No |
| 7274 | avg_archive1 | maximum | 4 | 1 | Not Used | No |
| 7275 | avg_archive1 | maximum | 5 | 1 | Not Used | No |
| 7276 | avg_archive1 | maximum | 6 | 1 | Not Used | No |
| 7277 | avg_archive1 | maximum | 7 | 1 | Not Used | No |
| 7278 | avg_archive1 | maximum | 8 | 1 | Not Used | No |
| 7279 | avg_archive1 | maximum | 9 | 1 | Not Used | No |
| 7280 | avg_archive1 | maximum | 10 | 1 | Not Used | No |
| 7281 | avg_archive1 | maximum | 11 | 1 | Not Used | No |
| 7282 | avg_archive1 | maximum | 12 | 1 | Not Used | No |
| 7283 | avg_archive1 | maximum | 13 | 1 | Not Used | No |
| 7284 | avg_archive1 | maximum | 14 | 1 | Not Used | No |
| 7285 | avg_archive1 | maximum | 15 | 1 | Not Used | No |
| 7286 | avg_archive1 | maximum | 16 | 1 | Not Used | No |
| 7287 | avg_archive1 | maximum | 17 | 1 | Not Used | No |
| 7288 | avg_archive1 | maximum | 18 | 1 | Not Used | No |
| 7289 | avg_archive1 | maximum | 19 | 1 | Not Used | No |
| 7290 | avg_archive1 | maximum | 20 | 1 | Not Used | No |
| 7291 | avg_archive1 | maximum | 21 | 1 | Not Used | No |
| 7292 | avg_archive1 | maximum | 22 | 1 | Not Used | No |
| 7293 | avg_archive1 | maximum | 23 | 1 | Not Used | No |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7294 | avg_archive1 | maximum | 24 | 1 | Not Used | No |
| 7295 | avg_archive1 | maximum | 25 | 1 | Not Used | No |
| 7296 | avg_archive1 | maximum | 26 | 1 | Not Used | No |
| 7297 | avg_archive1 | maximum | 27 | 1 | Not Used | No |
| 7298 | avg_archive1 | maximum | 28 | 1 | Not Used | No |
| 7299 | avg_archive1 | maximum | 29 | 1 | Not Used | No |
| 7300 | avg_archive1 | maximum | 30 | 1 | Not Used | No |
| 7301 | avg_archive1 | maximum | 31 | 1 | Not Used | No |
| 7302 | avg_archive1 | maximum | 32 | 1 | Not Used | No |
| 7303 | avg_archive1 | maximum | 33 | 1 | Not Used | No |
| 7304 | avg_archive1 | maximum | 34 | 1 | Not Used | No |
| 7305 | avg_archive1 | maximum | 35 | 1 | Not Used | No |
| 7306 | avg_archive1 | maximum | 36 | 1 | Not Used | No |
| 7307 | avg_archive1 | minimum | 1 | 1 | Not Used | No |
| 7308 | avg_archive1 | minimum | 2 | 1 | Not Used | No |
| 7309 | avg_archive1 | minimum | 3 | 1 | Not Used | No |
| 7310 | avg_archive1 | minimum | 4 | 1 | Not Used | No |
| 7311 | avg_archive1 | minimum | 5 | 1 | Not Used | No |
| 7312 | avg_archive1 | minimum | 6 | 1 | Not Used | No |
| 7313 | avg_archive1 | minimum | 7 | 1 | Not Used | No |
| 7314 | avg_archive1 | minimum | 8 | 1 | Not Used | No |
| 7315 | avg_archive1 | minimum | 9 | 1 | Not Used | No |
| 7316 | avg_archive1 | minimum | 10 | 1 | Not Used | No |
| 7317 | avg_archive1 | minimum | 11 | 1 | Not Used | No |
| 7318 | avg_archive1 | minimum | 12 | 1 | Not Used | No |
| 7319 | avg_archive1 | minimum | 13 | 1 | Not Used | No |
| 7320 | avg_archive1 | minimum | 14 | 1 | Not Used | No |
| 7321 | avg_archive1 | minimum | 15 | 1 | Not Used | No |
| 7322 | avg_archive1 | minimum | 16 | 1 | Not Used | No |
| 7323 | avg_archive1 | minimum | 17 | 1 | Not Used | No |
| 7324 | avg_archive1 | minimum | 18 | 1 | Not Used | No |
| 7325 | avg_archive1 | minimum | 19 | 1 | Not Used | No |
| 7326 | avg_archive1 | minimum | 20 | 1 | Not Used | No |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7327 | avg_archive1 | minimum | 21 | 1 | Not Used | No |
| 7328 | avg_archive1 | minimum | 22 | 1 | Not Used | No |
| 7329 | avg_archive1 | minimum | 23 | 1 | Not Used | No |
| 7330 | avg_archive1 | minimum | 24 | 1 | Not Used | No |
| 7331 | avg_archive1 | minimum | 25 | 1 | Not Used | No |
| 7332 | avg_archive1 | minimum | 26 | 1 | Not Used | No |
| 7333 | avg_archive1 | minimum | 27 | 1 | Not Used | No |
| 7334 | avg_archive1 | minimum | 28 | 1 | Not Used | No |
| 7335 | avg_archive1 | minimum | 29 | 1 | Not Used | No |
| 7336 | avg_archive1 | minimum | 30 | 1 | Not Used | No |
| 7337 | avg_archive1 | minimum | 31 | 1 | Not Used | No |
| 7338 | avg_archive1 | minimum | 32 | 1 | Not Used | No |
| 7339 | avg_archive1 | minimum | 33 | 1 | Not Used | No |
| 7340 | avg_archive1 | minimum | 34 | 1 | Not Used | No |
| 7341 | avg_archive1 | minimum | 35 | 1 | Not Used | No |
| 7342 | avg_archive1 | minimum | 36 | 1 | Not Used | No |
| 7343 | avg_archive1 | avg | 1 | 2 | Not Used | No |
| 7344 | avg_archive1 | avg | 2 | 2 | Not Used | No |
| 7345 | avg_archive1 | avg | 3 | 2 | Not Used | No |
| 7346 | avg_archive1 | avg | 4 | 2 | Not Used | No |
| 7347 | avg_archive1 | avg | 5 | 2 | Not Used | No |
| 7348 | avg_archive1 | avg | 6 | 2 | Not Used | No |
| 7349 | avg_archive1 | avg | 7 | 2 | Not Used | No |
| 7350 | avg_archive1 | avg | 8 | 2 | Not Used | No |
| 7351 | avg_archive1 | avg | 9 | 2 | Not Used | No |
| 7352 | avg_archive1 | avg | 10 | 2 | Not Used | No |
| 7353 | avg_archive1 | avg | 11 | 2 | Not Used | No |
| 7354 | avg_archive1 | avg | 12 | 2 | Not Used | No |
| 7355 | avg_archive1 | avg | 13 | 2 | Not Used | No |
| 7356 | avg_archive1 | avg | 14 | 2 | Not Used | No |
| 7357 | avg_archive1 | avg | 15 | 2 | Not Used | No |
| 7358 | avg_archive1 | avg | 16 | 2 | Not Used | No |
| 7359 | avg_archive1 | avg | 17 | 2 | Not Used | No |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7360 | avg_archive1 | avg | 18 | 2 | Not Used | No |
| 7361 | avg_archive1 | avg | 19 | 2 | Not Used | No |
| 7362 | avg_archive1 | avg | 20 | 2 | Not Used | No |
| 7363 | avg_archive1 | avg | 21 | 2 | Not Used | No |
| 7364 | avg_archive1 | avg | 22 | 2 | Not Used | No |
| 7365 | avg_archive1 | avg | 23 | 2 | Not Used | No |
| 7366 | avg_archive1 | avg | 24 | 2 | Not Used | No |
| 7367 | avg_archive1 | avg | 25 | 2 | Not Used | No |
| 7368 | avg_archive1 | avg | 26 | 2 | Not Used | No |
| 7369 | avg_archive1 | avg | 27 | 2 | Not Used | No |
| 7370 | avg_archive1 | avg | 28 | 2 | Not Used | No |
| 7371 | avg_archive1 | avg | 29 | 2 | Not Used | No |
| 7372 | avg_archive1 | avg | 30 | 2 | Not Used | No |
| 7373 | avg_archive1 | avg | 31 | 2 | Not Used | No |
| 7374 | avg_archive1 | avg | 32 | 2 | Not Used | No |
| 7375 | avg_archive1 | avg | 33 | 2 | Not Used | No |
| 7376 | avg_archive1 | avg | 34 | 2 | Not Used | No |
| 7377 | avg_archive1 | avg | 35 | 2 | Not Used | No |
| 7378 | avg_archive1 | avg | 36 | 2 | Not Used | No |
| 7379 | avg_archive1 | maximum | 1 | 2 | Not Used | No |
| 7380 | avg_archive1 | maximum | 2 | 2 | Not Used | No |
| 7381 | avg_archive1 | maximum | 3 | 2 | Not Used | No |
| 7382 | avg_archive1 | maximum | 4 | 2 | Not Used | No |
| 7383 | avg_archive1 | maximum | 5 | 2 | Not Used | No |
| 7384 | avg_archive1 | maximum | 6 | 2 | Not Used | No |
| 7385 | avg_archive1 | maximum | 7 | 2 | Not Used | No |
| 7386 | avg_archive1 | maximum | 8 | 2 | Not Used | No |
| 7387 | avg_archive1 | maximum | 9 | 2 | Not Used | No |
| 7388 | avg_archive1 | maximum | 10 | 2 | Not Used | No |
| 7389 | avg_archive1 | maximum | 11 | 2 | Not Used | No |
| 7390 | avg_archive1 | maximum | 12 | 2 | Not Used | No |
| 7391 | avg_archive1 | maximum | 13 | 2 | Not Used | No |
| 7392 | avg_archive1 | maximum | 14 | 2 | Not Used | No |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7393 | avg_archive1 | maximum | 15 | 2 | Not Used | No |
| 7394 | avg_archive1 | maximum | 16 | 2 | Not Used | No |
| 7395 | avg_archive1 | maximum | 17 | 2 | Not Used | No |
| 7396 | avg_archive1 | maximum | 18 | 2 | Not Used | No |
| 7397 | avg_archive1 | maximum | 19 | 2 | Not Used | No |
| 7398 | avg_archive1 | maximum | 20 | 2 | Not Used | No |
| 7399 | avg_archive1 | maximum | 21 | 2 | Not Used | No |
| 7400 | avg_archive1 | maximum | 22 | 2 | Not Used | No |
| 7401 | avg_archive1 | maximum | 23 | 2 | Not Used | No |
| 7402 | avg_archive1 | maximum | 24 | 2 | Not Used | No |
| 7403 | avg_archive1 | maximum | 25 | 2 | Not Used | No |
| 7404 | avg_archive1 | maximum | 26 | 2 | Not Used | No |
| 7405 | avg_archive1 | maximum | 27 | 2 | Not Used | No |
| 7406 | avg_archive1 | maximum | 28 | 2 | Not Used | No |
| 7407 | avg_archive1 | maximum | 29 | 2 | Not Used | No |
| 7408 | avg_archive1 | maximum | 30 | 2 | Not Used | No |
| 7409 | avg_archive1 | maximum | 31 | 2 | Not Used | No |
| 7410 | avg_archive1 | maximum | 32 | 2 | Not Used | No |
| 7411 | avg_archive1 | maximum | 33 | 2 | Not Used | No |
| 7412 | avg_archive1 | maximum | 34 | 2 | Not Used | No |
| 7413 | avg_archive1 | maximum | 35 | 2 | Not Used | No |
| 7414 | avg_archive1 | maximum | 36 | 2 | Not Used | No |
| 7415 | avg_archive1 | minimum | 1 | 2 | Not Used | No |
| 7416 | avg_archive1 | minimum | 2 | 2 | Not Used | No |
| 7417 | avg_archive1 | minimum | 3 | 2 | Not Used | No |
| 7418 | avg_archive1 | minimum | 4 | 2 | Not Used | No |
| 7419 | avg_archive1 | minimum | 5 | 2 | Not Used | No |
| 7420 | avg_archive1 | minimum | 6 | 2 | Not Used | No |
| 7421 | avg_archive1 | minimum | 7 | 2 | Not Used | No |
| 7422 | avg_archive1 | minimum | 8 | 2 | Not Used | No |
| 7423 | avg_archive1 | minimum | 9 | 2 | Not Used | No |
| 7424 | avg_archive1 | minimum | 10 | 2 | Not Used | No |
| 7425 | avg_archive1 | minimum | 11 | 2 | Not Used | No |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7426 | avg_archive1 | minimum | 12 | 2 | Not Used | No |
| 7427 | avg_archive1 | minimum | 13 | 2 | Not Used | No |
| 7428 | avg_archive1 | minimum | 14 | 2 | Not Used | No |
| 7429 | avg_archive1 | minimum | 15 | 2 | Not Used | No |
| 7430 | avg_archive1 | minimum | 16 | 2 | Not Used | No |
| 7431 | avg_archive1 | minimum | 17 | 2 | Not Used | No |
| 7432 | avg_archive1 | minimum | 18 | 2 | Not Used | No |
| 7433 | avg_archive1 | minimum | 19 | 2 | Not Used | No |
| 7434 | avg_archive1 | minimum | 20 | 2 | Not Used | No |
| 7435 | avg_archive1 | minimum | 21 | 2 | Not Used | No |
| 7436 | avg_archive1 | minimum | 22 | 2 | Not Used | No |
| 7437 | avg_archive1 | minimum | 23 | 2 | Not Used | No |
| 7438 | avg_archive1 | minimum | 24 | 2 | Not Used | No |
| 7439 | avg_archive1 | minimum | 25 | 2 | Not Used | No |
| 7440 | avg_archive1 | minimum | 26 | 2 | Not Used | No |
| 7441 | avg_archive1 | minimum | 27 | 2 | Not Used | No |
| 7442 | avg_archive1 | minimum | 28 | 2 | Not Used | No |
| 7443 | avg_archive1 | minimum | 29 | 2 | Not Used | No |
| 7444 | avg_archive1 | minimum | 30 | 2 | Not Used | No |
| 7445 | avg_archive1 | minimum | 31 | 2 | Not Used | No |
| 7446 | avg_archive1 | minimum | 32 | 2 | Not Used | No |
| 7447 | avg_archive1 | minimum | 33 | 2 | Not Used | No |
| 7448 | avg_archive1 | minimum | 34 | 2 | Not Used | No |
| 7449 | avg_archive1 | minimum | 35 | 2 | Not Used | No |
| 7450 | avg_archive1 | minimum | 36 | 2 | Not Used | No |
| 7451 | avg_archive1 | avg | 1 | 3 | Not Used | No |
| 7452 | avg_archive1 | avg | 2 | 3 | Not Used | No |
| 7453 | avg_archive1 | avg | 3 | 3 | Not Used | No |
| 7454 | avg_archive1 | avg | 4 | 3 | Not Used | No |
| 7455 | avg_archive1 | avg | 5 | 3 | Not Used | No |
| 7456 | avg_archive1 | avg | 6 | 3 | Not Used | No |
| 7457 | avg_archive1 | avg | 7 | 3 | Not Used | No |
| 7458 | avg_archive1 | avg | 8 | 3 | Not Used | No |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7459 | avg_archive1 | avg | 9 | 3 | Not Used | No |
| 7460 | avg_archive1 | avg | 10 | 3 | Not Used | No |
| 7461 | avg_archive1 | avg | 11 | 3 | Not Used | No |
| 7462 | avg_archive1 | avg | 12 | 3 | Not Used | No |
| 7463 | avg_archive1 | avg | 13 | 3 | Not Used | No |
| 7464 | avg_archive1 | avg | 14 | 3 | Not Used | No |
| 7465 | avg_archive1 | avg | 15 | 3 | Not Used | No |
| 7466 | avg_archive1 | avg | 16 | 3 | Not Used | No |
| 7467 | avg_archive1 | avg | 17 | 3 | Not Used | No |
| 7468 | avg_archive1 | avg | 18 | 3 | Not Used | No |
| 7469 | avg_archive1 | avg | 19 | 3 | Not Used | No |
| 7470 | avg_archive1 | avg | 20 | 3 | Not Used | No |
| 7471 | avg_archive1 | avg | 21 | 3 | Not Used | No |
| 7472 | avg_archive1 | avg | 22 | 3 | Not Used | No |
| 7473 | avg_archive1 | avg | 23 | 3 | Not Used | No |
| 7474 | avg_archive1 | avg | 24 | 3 | Not Used | No |
| 7475 | avg_archive1 | avg | 25 | 3 | Not Used | No |
| 7476 | avg_archive1 | avg | 26 | 3 | Not Used | No |
| 7477 | avg_archive1 | avg | 27 | 3 | Not Used | No |
| 7478 | avg_archive1 | avg | 28 | 3 | Not Used | No |
| 7479 | avg_archive1 | avg | 29 | 3 | Not Used | No |
| 7480 | avg_archive1 | avg | 30 | 3 | Not Used | No |
| 7481 | avg_archive1 | avg | 31 | 3 | Not Used | No |
| 7482 | avg_archive1 | avg | 32 | 3 | Not Used | No |
| 7483 | avg_archive1 | avg | 33 | 3 | Not Used | No |
| 7484 | avg_archive1 | avg | 34 | 3 | Not Used | No |
| 7485 | avg_archive1 | avg | 35 | 3 | Not Used | No |
| 7486 | avg_archive1 | avg | 36 | 3 | Not Used | No |
| 7487 | avg_archive1 | maximum | 1 | 3 | Not Used | No |
| 7488 | avg_archive1 | maximum | 2 | 3 | Not Used | No |
| 7489 | avg_archive1 | maximum | 3 | 3 | Not Used | No |
| 7490 | avg_archive1 | maximum | 4 | 3 | Not Used | No |
| 7491 | avg_archive1 | maximum | 5 | 3 | Not Used | No |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7492 | avg_archive1 | maximum | 6 | 3 | Not Used | No |
| 7493 | avg_archive1 | maximum | 7 | 3 | Not Used | No |
| 7494 | avg_archive1 | maximum | 8 | 3 | Not Used | No |
| 7495 | avg_archive1 | maximum | 9 | 3 | Not Used | No |
| 7496 | avg_archive1 | maximum | 10 | 3 | Not Used | No |
| 7497 | avg_archive1 | maximum | 11 | 3 | Not Used | No |
| 7498 | avg_archive1 | maximum | 12 | 3 | Not Used | No |
| 7499 | avg_archive1 | maximum | 13 | 3 | Not Used | No |
| 7500 | avg_archive1 | maximum | 14 | 3 | Not Used | No |
| 7501 | avg_archive1 | maximum | 15 | 3 | Not Used | No |
| 7502 | avg_archive1 | maximum | 16 | 3 | Not Used | No |
| 7503 | avg_archive1 | maximum | 17 | 3 | Not Used | No |
| 7504 | avg_archive1 | maximum | 18 | 3 | Not Used | No |
| 7505 | avg_archive1 | maximum | 19 | 3 | Not Used | No |
| 7506 | avg_archive1 | maximum | 20 | 3 | Not Used | No |
| 7507 | avg_archive1 | maximum | 21 | 3 | Not Used | No |
| 7508 | avg_archive1 | maximum | 22 | 3 | Not Used | No |
| 7509 | avg_archive1 | maximum | 23 | 3 | Not Used | No |
| 7510 | avg_archive1 | maximum | 24 | 3 | Not Used | No |
| 7511 | avg_archive1 | maximum | 25 | 3 | Not Used | No |
| 7512 | avg_archive1 | maximum | 26 | 3 | Not Used | No |
| 7513 | avg_archive1 | maximum | 27 | 3 | Not Used | No |
| 7514 | avg_archive1 | maximum | 28 | 3 | Not Used | No |
| 7515 | avg_archive1 | maximum | 29 | 3 | Not Used | No |
| 7516 | avg_archive1 | maximum | 30 | 3 | Not Used | No |
| 7517 | avg_archive1 | maximum | 31 | 3 | Not Used | No |
| 7518 | avg_archive1 | maximum | 32 | 3 | Not Used | No |
| 7519 | avg_archive1 | maximum | 33 | 3 | Not Used | No |
| 7520 | avg_archive1 | maximum | 34 | 3 | Not Used | No |
| 7521 | avg_archive1 | maximum | 35 | 3 | Not Used | No |
| 7522 | avg_archive1 | maximum | 36 | 3 | Not Used | No |
| 7523 | avg_archive1 | minimum | 1 | 3 | Not Used | No |
| 7524 | avg_archive1 | minimum | 2 | 3 | Not Used | No |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7525 | avg_archive1 | minimum | 3 | 3 | Not Used | No |
| 7526 | avg_archive1 | minimum | 4 | 3 | Not Used | No |
| 7527 | avg_archive1 | minimum | 5 | 3 | Not Used | No |
| 7528 | avg_archive1 | minimum | 6 | 3 | Not Used | No |
| 7529 | avg_archive1 | minimum | 7 | 3 | Not Used | No |
| 7530 | avg_archive1 | minimum | 8 | 3 | Not Used | No |
| 7531 | avg_archive1 | minimum | 9 | 3 | Not Used | No |
| 7532 | avg_archive1 | minimum | 10 | 3 | Not Used | No |
| 7533 | avg_archive1 | minimum | 11 | 3 | Not Used | No |
| 7534 | avg_archive1 | minimum | 12 | 3 | Not Used | No |
| 7535 | avg_archive1 | minimum | 13 | 3 | Not Used | No |
| 7536 | avg_archive1 | minimum | 14 | 3 | Not Used | No |
| 7537 | avg_archive1 | minimum | 15 | 3 | Not Used | No |
| 7538 | avg_archive1 | minimum | 16 | 3 | Not Used | No |
| 7539 | avg_archive1 | minimum | 17 | 3 | Not Used | No |
| 7540 | avg_archive1 | minimum | 18 | 3 | Not Used | No |
| 7541 | avg_archive1 | minimum | 19 | 3 | Not Used | No |
| 7542 | avg_archive1 | minimum | 20 | 3 | Not Used | No |
| 7543 | avg_archive1 | minimum | 21 | 3 | Not Used | No |
| 7544 | avg_archive1 | minimum | 22 | 3 | Not Used | No |
| 7545 | avg_archive1 | minimum | 23 | 3 | Not Used | No |
| 7546 | avg_archive1 | minimum | 24 | 3 | Not Used | No |
| 7547 | avg_archive1 | minimum | 25 | 3 | Not Used | No |
| 7548 | avg_archive1 | minimum | 26 | 3 | Not Used | No |
| 7549 | avg_archive1 | minimum | 27 | 3 | Not Used | No |
| 7550 | avg_archive1 | minimum | 28 | 3 | Not Used | No |
| 7551 | avg_archive1 | minimum | 29 | 3 | Not Used | No |
| 7552 | avg_archive1 | minimum | 30 | 3 | Not Used | No |
| 7553 | avg_archive1 | minimum | 31 | 3 | Not Used | No |
| 7554 | avg_archive1 | minimum | 32 | 3 | Not Used | No |
| 7555 | avg_archive1 | minimum | 33 | 3 | Not Used | No |
| 7556 | avg_archive1 | minimum | 34 | 3 | Not Used | No |
| 7557 | avg_archive1 | minimum | 35 | 3 | Not Used | No |

```
 7558  avg_archive1 minimum     36   3    Not Used
No
********************************************************************************
*******
********************************************************************************
*****

TCP/IP Report from Model 2350A
4/28/2005 2:00:51 PM

--------------------------------------------------------------------------------
-----
Usage                              PC
Comm ID                            0
Host Name                          DANIELGC
Use DHCP/Specify an IP address     Specify an IP Address
IP Address                         172.16.23.128
Subnet Mask                        255.255.240.0
Gateway                            172.16.16.2
Read/Write                         RW
********************************************************************************
*****


Temperature Control Report from Model 2350A
4/28/2005 2:00:52 PM

Loop             1                2                3                4
--------------------------------------------------------------------------------
-----
Mode            Automatic        Automatic        Automatic        Automatic
Prop Gain        60               60               60               60
Reset            600              600              600              600
Rate             1                1                1                1
D Filter         5                5                5                5
Setpoint         82               84               40               350
********************************************************************************
*****
End of Report
```

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# APPENDIX B, COMPONENT DATA TABLE

## B.1 COMPONENT DATA TABLE

This appendix provides a sample standard Component Data Table as well as a table of the ISO-related components.

- Table B-1, Example Standard Component Data Table
- Figure B-1, Example Standard Component Data Table

All values depend on a base pressure of 14.73 PSIA and a base temperature of 60 $^{o}$F (15.56 $^{o}$C).

BTU components reference GPA Standard 2145-03.

**Note: * Denotes components that are assigned temporary I.D. Codes, starting with 150, as they are used.**

*Table B-1 Example Standard Component Data Table*

| Component Name | Mol Wt | Reid Vapor | Rel Dens Gas | Rel Dens Liquid | Lb/gal | GPM Factor | Gross Dry BTU | Net Dry BTU | AGA8 No. | Daniel Sim 2251 I.D. No. |
|---|---|---|---|---|---|---|---|---|---|---|
| Acetylene | 26.04 | 0.0 | 0.8990 | 0.6150 | 0.0 | 0.0 | 1476.9 | 1426.5 | 4 | 22 |
| Air | 28.9625 | 0.0 | 0.87484 | 0.8748 | 7.2931 | 0.10489 | 0.0 | 0.0 | 26 | 26 |
| Argon | 39.95 | 0.0 | 1.3792 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 21 | 46 |
| Ammonia | 17.03 | 212.00 | 0.5880 | 0.6173 | 5.1500 | 0.0874 | 435.4 | 359.8 | 0 | * |
| Benzene | 78.11 | 3.2240 | 2.6969 | 0.8844 | 7.3730 | 0.2798 | 3750.5 | 3599.2 | 15 | * |
| Butanes | 58.123 | 62.084 | 2.0068 | 0.5735 | 4.7815 | 0.32117 | 3264.67 | 3012.45 | 12 | 33 |
| Butene-1 | 56.11 | 63.050 | 1.9372 | 0.6013 | 5.0130 | 0.2956 | 3087.0 | 2885.4 | 12 | 28 |
| Butenes | 56.11 | 55.448 | 1.9372 | 0.6097 | 5.0833 | 0.2916 | 3077.4 | 2875.7 | 12 | 32 |
| 1,2-Butadiene | 54.09 | 20.000 | 1.8676 | 0.6580 | 5.4860 | 0.2604 | 2946.7 | 2795.5 | 12 | 35 |
| 1,3-Butadiene | 54.09 | 60.000 | 1.8676 | 0.6272 | 5.2290 | 0.2732 | 2886.6 | 2735.3 | 12 | 34 |
| C3+ | 44.097 | 188.74 | 1.5226 | 0.50736 | 4.2305 | 0.27534 | 2522.02 | 2320.36 | 5 | 47 |
| C4+ | 58.123 | 51.683 | 2.0068 | 0.58407 | 4.8696 | 0.31525 | 3269.94 | 3017.97 | 12 | 48 |
| C4=1 | 56.11 | 63.050 | 1.9372 | 0.6013 | 5.0130 | 0.2956 | 3087.0 | 2885.4 | 12 | 29 |
| C5+ | 72.15 | 15.558 | 2.4912 | 0.63111 | 5.2618 | 0.36216 | 4018.97 | 3715.58 | 14 | 49 |
| C6+ 47/35/17 | 95.9577 | 3.0199 | 3.31319 | 0.67994 | 5.6689 | 0.44618 | 5288.73 | 4900.61 | 22 | 08 |
| C6+ 50/50/00 | 93.1905 | 3.2909 | 3.21765 | 0.6761 | 5.6369 | 0.43621 | 5141.17 | 4762.99 | 23 | 09 |
| C6+ GPA 2261-99 | 93.191 | 3.5166 | 3.2177 | 0.67557 | 5.6325 | 0.4626 | 5141.13 | 4762.99 | 24 | 10 |
| C6+ 57/28/14 | 94.1923 | 3.3740 | 3.25224 | 0.67706 | 5.6449 | 0.43986 | 5194.55 | 4812.81 | 25 | 11 |
| Carbon Monoxide | 28.01 | 0.0 | 0.9671 | 0.8010 | 6.6800 | 0.0 | 321.2 | 321.2 | 9 | 15 |
| Carbon Dioxide | 44.01 | 0.0 | 1.5196 | 0.82275 | 6.8596 | 0.16946 | 0.0 | 0.0 | 3 | 17 |
| CIS-2-Butene | 56.11 | 45.540 | 1.9372 | 0.6271 | 5.2280 | 0.2835 | 3079.3 | 2877.6 | 12 | 31 |
| COS | 60.08 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 42 |
| CS2 | 76.14 | 0.0 | 2.6298 | 0.0 | 0.0 | 0.0 | 1267.0 | 1267.0 | 0 | 41 |
| Cyclohexane | 84.16 | 3.2640 | 2.9057 | 0.7834 | 6.5310 | 0.3403 | 4492.1 | 4189.4 | 15 | * |
| Cyclopentane | 70.14 | 9.9140 | 2.4215 | 0.7504 | 6.2560 | 0.2961 | 3772.4 | 3520.2 | 14 | * |
| Diisobutyl | 114.23 | 1.1010 | 3.9439 | 0.6979 | 5.8190 | 0.5185 | 6247.9 | 5793.9 | 17 | * |
| 2,3-Dimethbutan | 86.18 | 7.4040 | 2.9753 | 0.6664 | 5.5560 | 0.4096 | 4756.0 | 4403.1 | 15 | * |
| 2,2-Dimethpenta | 100.21 | 3.4920 | 3.4596 | 0.6782 | 5.6540 | 0.4682 | 5494.6 | 5091.4 | 16 | * |
| 2,4-Dimethpenta | 100.21 | 3.2920 | 3.4596 | 0.6773 | 5.6470 | 0.4686 | 5499.4 | 5096.0 | 16 | * |

*Table B-1 Example Standard Component Data Table (Continued)*

| Component Name | Mol Wt | Reid Vapor | Rel Dens Gas | Rel Dens Liquid | Lb/gal | GPM Factor | Gross Dry BTU | Net Dry BTU | AGA8 No. | Daniel Sim 2251 I.D. No. |
|---|---|---|---|---|---|---|---|---|---|---|
| 3,3-Dimethpenta | 100.2 | 2.7730 | 3.4596 | 0.6976 | 5.8160 | 0.4550 | 5501.5 | 5098.2 | 16 | * |
| Ethane | 30.07 | 800.00 | 1.0382 | 0.35639 | 2.9714 | 0.26729 | 1773.79 | 1622.74 | 4 | 01 |
| Ethyl alchohol | 46.07 | 2.3000 | 1.5906 | 0.7940 | 6.6200 | 0.1839 | 1602.8 | 1451.5 | 0 | * |
| Ethyl benzene | 106.17 | 0.3710 | 3.6655 | 0.8718 | 7.2680 | 0.3858 | 5234.3 | 4982.0 | 17 | * |
| Ethylene | 28.054 | 850.0 | 0.9686 | 0.23569 | 1.965 | 0.37707 | 1604.1 | 1502.47 | 4 | 21 |
| Ethylene Oxide | 44.05 | 0.0 | 1.4900 | 0.0 | 0.0 | 0.0 | 1459.4 | 1410.2 | 0 | 36 |
| 3-Ethyl pentane | 100.21 | 2.0120 | 3.4596 | 0.7028 | 5.8590 | 0.4517 | 5513.4 | 5110.1 | 16 | * |
| H2S | 34.08 | 394.67 | 1.1767 | 0.80267 | 6.6922 | 0.134506 | 638.6 | 588.178 | 7 | 40 |
| HCL | 36.46 | 925.00 | 1.2588 | 0.8558 | 7.1350 | 0.1349 | 0.0 | 0.0 | 0 | * |
| Helium | 4.002602 | 0.0 | 0.1382 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 20 | 13 |
| Hydrogen | 2.02 | 0.0 | 0.0696 | 0.0700 | 0.0 | 0.0 | 325.00 | 274.4 | 8 | 12 |
| i-Butane | 58.123 | 72.484 | 2.0068 | 0.56293 | 4.6934 | 0.32709 | 3259.4 | 3006.94 | 11 | 03 |
| i-Butene | 56.11 | 63.400 | 1.9372 | 0.6004 | 5.0060 | 0.2960 | 3068.2 | 2866.5 | 12 | 27 |
| i-Pentane | 72.15 | 20.456 | 2.4912 | 0.62459 | 5.2074 | 0.36594 | 4010.2 | 3707.6 | 13 | 05 |
| i-Propyl benzene | 120.19 | 0.1880 | 4.1498 | 0.8663 | 7.2230 | 0.4396 | 5976.6 | 5674.0 | 18 | * |
| i-Octane | 114.23 | 1.7080 | 3.9439 | 0.6962 | 5.8040 | 0.5199 | 6246.1 | 5792.2 | 17 | * |
| Methane | 16.043 | 5000.0 | 0.55392 | 0.3 | 2.5 | 0.26412 | 1012.3 | 911.1 | 1 | 00 |
| Methyl alcohol | 32.04 | 4.6300 | 1.1063 | 0.7960 | 6.6400 | 0.1275 | 868.7 | 767.9 | 0 | * |
| Methycyclo C5 | 84.16 | 4.5030 | 2.9057 | 0.7536 | 6.2830 | 0.3538 | 4511.6 | 4209.1 | 15 | * |
| Methylcyclo C6 | 98.19 | 1.6090 | 3.3900 | 0.7740 | 6.4530 | 0.4019 | 5228.0 | 4874.9 | 16 | * |
| 2-Methylhexane | 100.21 | 2.2710 | 3.4596 | 0.6830 | 5.6940 | 0.4647 | 5507.3 | 5104.0 | 16 | * |
| 3-Methylhexane | 100.21 | 2.1300 | 3.4596 | 0.6917 | 5.7670 | 0.4589 | 5511.3 | 5107.8 | 16 | * |
| m-Xylene | 106.17 | 0.3260 | 3.6655 | 0.8687 | 7.2430 | 0.3871 | 5219.9 | 4967.8 | 17 | * |
| n-Butane | 58.123 | 51.683 | 2.0068 | 0.58407 | 4.8690 | 0.31525 | 3269.94 | 3017.97 | 12 | 04 |
| n-Decane | 142.285 | 0.05889 | 4.9127 | 0.73404 | 6.12 | 0.61405 | 7760.8 | 7206.63 | 19 | * |
| n-Heptane | 100.204 | 1.6203 | 3.4598 | 0.68817 | 5.7375 | 0.46128 | 5515.33 | 5111.8 | 16 | 45 |
| n-Hexane | 86.177 | 4.9614 | 2.9755 | 0.66403 | 5.5363 | 0.41114 | 4767.0 | 4414.18 | 15 | 39 |
| n-Nonane | 128.258 | 0.1796 | 4.4284 | 0.72185 | 6.0183 | 0.56288 | 7012.386 | 6508.02 | 18 | 38 |
| n-Octane | 114.231 | 0.5366 | 3.9441 | 0.70696 | 5.8942 | 0.51188 | 6263.26 | 5809.41 | 17 | 20 |
| n-Pentane | 72.15 | 15.558 | 2.4912 | 0.63111 | 5.2618 | 0.36216 | 4017.974 | 3715.58 | 14 | 06 |

*Table B-1 Example Standard Component Data Table (Continued)*

| Component Name | Mol Wt | Reid Vapor | Rel Dens Gas | Rel Dens Liquid | Lb/gal | GPM Factor | Gross Dry BTU | Net Dry BTU | AGA8 No. | Daniel Sim 2251 I.D. No. |
|---|---|---|---|---|---|---|---|---|---|---|
| Neohexane | 86.18 | 9.8560 | 2.9753 | 0.6540 | 5.4530 | 0.4175 | 4747.2 | 4394.1 | 15 | * |
| Neopentane | 72.15 | 35.900 | 2.4911 | 0.5967 | 4.9750 | 0.3830 | 3993.9 | 3691.4 | 13 | 07 |
| Nitrogen | 28.0134 | 0.0 | 0.96723 | 0.80938 | 6.7481 | 0.10965 | 0.0 | 0.0 | 2 | 14 |
| NO2 | 46.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 19 |
| NO | 30.01 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | * |
| N2O | 44.02 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 18 |
| o-xylene | 106.2 | 0.2640 | 3.6655 | 0.8848 | 7.3770 | 0.3801 | 5222.0 | 4969.7 | 17 | * |
| Oxygen | 31.9988 | 0.0 | 1.1048 | 1.1421 | 9.5221 | 0.08876 | 0.0 | 0.0 | 10 | 16 |
| 1-Pentene | 70.14 | 19.115 | 2.4215 | 0.6457 | 5.3830 | 0.3441 | 3835.4 | 3583.3 | 14 | 37 |
| Propane | 44.097 | 188.74 | 1.5226 | 0.50736 | 4.2301 | 0.27534 | 2522.02 | 2320.36 | 5 | 02 |
| Propadiene | 40.07 | 0.0 | 1.4110 | 0.0 | 0.0 | 0.0 | 2254.2 | 2254.2 | 5 | 24 |
| Propylene | 42.081 | 227.87 | 1.4529 | 0.52264 | 4.3574 | 0.25507 | 2339.1 | 2187.05 | 5 | 23 |
| Propyne | 40.07 | 0.0 | 1.4110 | 0.0 | 0.0 | 0.0 | 2246.2 | 2246.2 | 5 | 25 |
| p-xylene | 106.17 | 0.3420 | 3.6655 | 0.8657 | 7.2180 | 0.3885 | 5220.8 | 4968.6 | 17 | * |
| Sulfur Dioxide | 64.06 | 88.000 | 2.2117 | 1.3970 | 11.650 | 0.1453 | 0.0 | 0.0 | 3 | 43 |
| Styrene | 104.15 | 0.2400 | 3.5959 | 0.9110 | 7.5950 | 0.3622 | 5042.7 | 4841.0 | 17 | * |
| Toluene | 92.14 | 1.0320 | 3.1812 | 0.8718 | 7.2680 | 0.3348 | 4485.4 | 4283.5 | 16 | * |
| Trans-2-Butene | 56.11 | 49.800 | 1.9372 | 0.6100 | 5.0860 | 0.2914 | 3075.1 | 2873.4 | 12 | 30 |
| Triptane | 100.21 | 3.3740 | 3.4596 | 0.6946 | 5.7910 | 0.4571 | 5496.2 | 5093.0 | 16 | * |
| Water | 18.0153 | 0.95028 | 0.62202 | 1.0000 | 8.3374 | 0.05707 | 50.4444 | 0.0 | 6 | 44 |

| Component Name | Molar Mass | Sum Factor (0 °C) | Sum Factor (15 °C) | Sum Factor (20 °C) | CV Sup kJ/Mol (0° C) | CV Sup kJ/Mol (15 °C) | CV Sup kJ/Mol (20 °C) | CV Sup kJ/Mol (25 °C) | CV Inf kJ/mol (0 °C) | CV Inf kJ/mol (15 °C) | CV Inf kJ/mol (20 °C) | CV Inf kJ/mol (25 °C) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetylene | 26.038 | 0.0949 | 0.0837 | 0.0837 | 1301.86 | 1301.37 | 1301.21 | 1301.05 | 1256.79 | 1256.94 | 1256.98 | 1257.03 |
| Air | 28.9625 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Argon | 39.948 | 0.0316 | 0.0283 | 0.0265 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ammonia | 17.0306 | 0.1225 | 0.1095 | 0.1049 | 384.57 | 383.51 | 383.16 | 382.81 | 316.96 | 316.86 | 316.79 | 316.79 |
| Benzene | 78.114 | 0.3017 | 0.272 | 0.253 | 3305.03 | 3302.86 | 3302.15 | 3301.48 | 3169.81 | 3169.56 | 3169.48 | 3169.38 |
| Butanes | 58.123 | 0.2059 | 0.183 | 0.1743 | 2879.01 | 2875.17 | 2873.98 | 2872.8 | 2653.64 | 2653.01 | 2652.86 | 2652.72 |
| Butene-1 | 56.108 | 0.1871 | 0.1732 | 0.1673 | 2721.55 | 2718.7 | 2717.75 | 2716.82 | 2541.25 | 2540.97 | 2540.86 | 2652.72 |
| Butenes | 56.108 | 0.1923 | 0.176 | 0.1717 | 2713.09 | 2710.23 | 2709.31 | 2708.36 | 2532.79 | 2532.49 | 2532.42 | 2532.27 |
| 1,2-Butadiene | 54.092 | 0.2121 | 0.1924 | 0.1871 | 2597.13 | 2595.12 | 2594.45 | 2593.79 | 2461.91 | 2461.82 | 2461.78 | 2461.74 |
| 1,3-Butadiene | 54.092 | 0.1844 | 0.1703 | 0.1643 | 2544.13 | 2542.1 | 2541.43 | 2540.77 | 2461.91 | 2408.8 | 2408.76 | 2408.72 |
| C3+ | 49.1464 | 0.1682 | 0.1534 | 0.147 | 2461.51 | 2458.25 | 2457.23 | 2456.16 | 2461.91 | 2264.52 | 2264.38 | 2264.25 |
| C4+ | 62.3311 | 0.2281 | 0.2049 | 0.1947 | 3081.63 | 3077.47 | 3076.32 | 3074.97 | 2461.91 | 2841.98 | 2841.83 | 2841.68 |

*Figure B-1 ISO Component Data Table*

| Component Name | Molar Mass | Sum Factor (0 °C) | Sum Factor (15 °C) | Sum Factor (20 °C) | CV Sup kJ/Mol (0° C) | CV Sup kJ/Mol (15 °C) | CV Sup kJ/Mol (20 °C) | CV Sup kJ/Mol (25 °C) | CV Inf kJ/mol (0 °C) | CV Inf kJ/mol (15 °C) | CV Inf kJ/mol (20 °C) | CV Inf kJ/mol (25 °C) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C4=1 | 56.108 | 0.1871 | 0.1732 | 0.1673 | 2721.55 | 2718.7 | 2717.75 | 2716.82 | 2541.25 | 2540.97 | 2540.86 | 2540.76 |
| C5+ | 76.6386 | 0.2999 | 0.2651 | 0.2505 | 3754.2 | 3749.68 | 3748.71 | 3746.71 | 3464.63 | 3468.87 | 3468.75 | 2540.76 |
| C6+ 47/35/17 | 95.9577 | 0.389 | 0.3459 | 0.3331 | 4663.16 | 4657.69 | 4655.86 | 4654.08 | 4316.22 | 4315.67 | 4315.46 | 4315.27 |
| C6+ 50/50/00 | 93.1905 | 0.3704 | 0.3305 | 0.3183 | 4533.05 | 4527.71 | 4525.93 | 4524.19 | 4194.99 | 4194.46 | 4194.25 | 4194.07 |
| C6+ 50/25/25 | 96.6972 | 0.3943 | 0.3503 | 0.3373 | 4697.93 | 4692.42 | 4690.58 | 4688.78 | 4348.61 | 4348.06 | 4194.25 | 4347.66 |
| C6+ 57/28/14 | 94.1923 | 0.3781 | 0.3367 | 0.3243 | 4580.15 | 4574.76 | 4572.96 | 4571.2 | 4238.87 | 4238.34 | 4238.12 | 4237.94 |
| Carbon Monoxide | 28.01 | 0.0265 | 0.0224 | 0.02 | 282.8 | 282.91 | 282.95 | 282.98 | 282.8 | 282.91 | 282.95 | 282.98 |
| Carbon Dioxide | 44.01 | 0.0819 | 0.0748 | 0.0728 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| CIS-2-Butene | 56.108 | 0.1975 | 0.1817 | 0.1761 | 2714.9 | 2711.9 | 2711 | 2710 | 2534.6 | 2534.2 | 2534.1 | 2533.9 |

*Figure B-1 ISO Component Data Table (Continued)*

| Component Name | Molar Mass | Sum Factor (0 °C) | Sum Factor (15 °C) | Sum Factor (20 °C) | CV Sup kJ/Mol (0° C) | CV Sup kJ/Mol (15 °C) | CV Sup kJ/Mol (20 °C) | CV Sup kJ/Mol (25 °C) | CV Inf kJ/mol (0 °C) | CV Inf kJ/mol (15 °C) | CV Inf kJ/mol (20 °C) | CV Inf kJ/mol (25 °C) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COS | 60.076 | 0.1225 | 0.114 | 0.1095 | 548.01 | 548.15 | 548.19 | 548.23 | 548.01 | 548.15 | 548.19 | 548.23 |
| CS2 | 76.143 | 0.2145 | 0.1949 | 0.1871 | 1104.06 | 1104.32 | 1104.41 | 1104.49 | 1104.06 | 1104.32 | 1104.21 | 1104.49 |
| Cyclohexane | 84.161 | 0.3209 | 0.2864 | 0.2757 | 3960.67 | 3956.02 | 3954.47 | 3952.96 | 3690.23 | 3689.42 | 3689.13 | 3688.86 |
| Cyclopentane | 70.134 | 0.255 | 0.2302 | 0.2236 | 3326.14 | 3322.19 | 3320.88 | 3319.59 | 3100.77 | 3100.03 | 3099.76 | 3099.51 |
| Diisobutyl | 114.23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2,3-Dimethbutan | 86.177 | 0.3 | 0.2739 | 0.2569 | 4193.63 | 4188.6 | 4186.93 | 4185.28 | 3878.11 | 3877.57 | 3877.36 | 3877.17 |
| 2,2-Dimethpenta | 100.24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2,4-Dimethpenta | 100.24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3,3-Dimethpenta | 100.24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ethane | 30.07 | 0.1 | 0.922 | 0.0894 | 1564.34 | 1562.14 | 1561.41 | 1560.69 | 1429.12 | 1428.84 | 1428.74 | 1428.64 |

*Figure B-1 ISO Component Data Table (Continued)*

| Component Name | Molar Mass | Sum Factor (0 °C) | Sum Factor (15 °C) | Sum Factor (20 °C) | CV Sup kJ/Mol (0° C) | CV Sup kJ/Mol (15 °C) | CV Sup kJ/Mol (20 °C) | CV Sup kJ/Mol (25 °C) | CV Inf kJ/mol (0 °C) | CV Inf kJ/mol (15 °C) | CV Inf kJ/mol (20 °C) | CV Inf kJ/mol (25 °C) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ethyl alchohol | 46.07 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ethyl benzene | 106.67 | 0.4858 | 0.4207 | 0.4037 | 4613.14 | 4609.53 | 4608.32 | 4607.15 | 4387.77 | 4387.37 | 4387.2 | 4387.07 |
| Ethylene | 28.054 | 0.0866 | 0.08 | 0.0775 | 1413.14 | 4609.53 | 4608.32 | 1411.18 | 1323.36 | 1323.24 | 1323.2 | 1323.15 |
| Ethylene Oxide | 44.05 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3-Ethyl pentane | 100.24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| H2S | 34.082 | 0.1 | 0.1 | 0.1 | 562.94 | 562.38 | 562.19 | 562.01 | 517.87 | 517.95 | 517.97 | 517.99 |
| HCL | 36.46 | 925 | 1.2588 | 0.8558 | 7.135 | 0.1349 | 0 | 0 | 0 | 0 | 0 | 0 |
| Helium | 4.0026 | 0.0006 | 0.0002 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hydrogen | 2.0159 | -0004 | -0.0048 | -0.0051 | 286.63 | 286.15 | 285.99 | 285.83 | 241.56 | 241.72 | 241.76 | 241.81 |
| i-Butane | 58.123 | 0.2049 | 0.1789 | 0.1703 | 2874.2 | 2870.58 | 2869.38 | 2868.2 | 2648.83 | 2648.42 | 2648.26 | 2648.12 |
| i-Butene | 56.108 | 0.1871 | 0.1703 | 0.1673 | 2704.8 | 2702 | 2701.1 | 2700.2 | 2524.5 | 2524.3 | 2524.2 | 2524.1 |

*Figure B-1 ISO Component Data Table (Continued)*

| Component Name | Molar Mass | Sum Factor (0 °C) | Sum Factor (15 °C) | Sum Factor (20 °C) | CV Sup kJ/Mol (0° C) | CV Sup kJ/Mol (15 °C) | CV Sup kJ/Mol (20 °C) | CV Sup kJ/Mol (25 °C) | CV Inf kJ/mol (0 °C) | CV Inf kJ/mol (15 °C) | CV Inf kJ/mol (20 °C) | CV Inf kJ/mol (25 °C) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| i-Pentane | 72.15 | 0.251 | 0.228 | 0.2168 | 3535.98 | 3531.68 | 3530.24 | 3528.83 | 3265.54 | 3265.08 | 3264.89 | 3264.73 |
| i-Propyl benzene | 120.19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| i-Octane | 114.23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Methane | 16.043 | 0.049 | 0.0447 | 0.0436 | 892.97 | 891.56 | 891.09 | 890.63 | 802.82 | 802.69 | 802.65 | 802.6 |
| Methyl alcohol | 32.042 | 0.4764 | 0.3578 | 0.3286 | 766.59 | 765.09 | 764.59 | 764.09 | 676.44 | 676.22 | 676.14 | 676.06 |
| Methycyclo C5 | 84.161 | 0.313 | 0.2811 | 0.2702 | 3977.04 | 3972.46 | 3970.93 | 3969.44 | 3705.34 | 3705.59 | 3705.86 | 3706.6 |
| Methylcyclo C6 | 98.188 | 0.3808 | 0.3376 | 0.3256 | 4600.64 | 4602.35 | 4604.09 | 4609.34 | 4292.53 | 4292.78 | 4293.06 | 4293.82 |
| 2-Methyl-hexane | 100.204 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3-Methyl-hexane | 100.204 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| m-Xylene | 106.167 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

*Figure B-1 ISO Component Data Table (Continued)*

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# APPENDIX C, DATA COMPUTATIONS

## C.1 DATA ACQUISITION

The 2350A GC Controller performs a 12-bit analog to digital (A/D) conversion every 25 milliseconds on channel 0 during an analysis period. This is the period when the left side of the display is counting the elapsed time of the analysis. The fixed number on the right side of the display is the total cycle time.

Exactly 40 equi-spaced data samples are taken every second for analysis by the controller. A sampling frequency of 40 Hertz (Hz) was chosen to reduce 60 Hz normal mode noise. After each point on the chromatograph signal is sampled, the resulting number is stored in a buffer area in the controller memory for processing. During the analysis, only the last 256 data points are available for processing. Because the data analysis is done as the signal is sampled (in real-time), only a limited number of past data samples is required to analyze any signal.

As a part of the data acquisition process, groups of incoming data samples are averaged together before storing to the controller memory for processing. Non-overlapping groups of N samples are averaged and stored and thus reduce the effective incoming data rate to 40/N samples/second. For example, if N = 5, then a total of 40/5 or 6 (averaged) data samples are stored every second. The value for the variable N is determined by the selection of a Peak Width parameter (PW). The relationship is:

$$N = PW$$

where PW is given in seconds. All the various details in the analysis process are independent of the value of N.

Allowable values of N are one to 63 which corresponds to values of PW from 2 to 63 seconds.

The variable N is known as the integration factor. This term is used because N determines how many points are averaged or integrated to form a single value. The integration of data upon input before storing serves two purposes. First, the statistical noise on the input signal is reduced by the square root of N. In the case of N = 4, a noise reduction of two would be realized. Secondly, the integration factor controls the bandwidth of the chromatograph signal. It is necessary to match the bandwidth of the input signal to that of the analysis algorithms in the 2350A. This prevents small, short duration perturbations from being recognized as true peaks by the program. It is therefore important to choose a Peak Width corresponding to the narrowest peak in a group under consideration.

## C.2 PEAK DETECTION

For normal area or peak height concentration evaluation, the determination of a peak's start, peak point, and end is automatic. The manual determination of start and end points is used only for area calculations in the Forced Integration mode. Automatic determination of peak onset or start is initiated whenever Integrate Inhibit is turned off. Analysis is started in a region of signal quiescence and stability such that the signal level and activity can be considered as baseline values. It is important that this be the case because the assumption is made by the 2350A software.

Having initiated a peak search by turning Inhibit off, the 2350A Controller performs a point by point examination of the signal slope. This is achieved by using a digital slope detection filter which is a combination low pass filter and differentiator. The output of this detector is constantly compared to a system constant entered by the operator called Slope Sensitivity. A default value of eight is assumed if no entry is made. Lower values make peak onset detection more sensitive and higher values make detection less sensitive. Higher values (20 to 100) would be appropriate for noisy signals, e.g. high amplifier gain. Peak termination is determined by the same application of this detector to the signal, but in the reverse sense. Onset is defined where the detector output exceeds the baseline constant, but termination is defined subsequently where the detector output is less than the same constant.

Sequences of fused peaks are also automatically handled. This is done by testing each termination point to see if the region immediately following it satisfies the criteria of a baseline. A baseline region must have a slope detector value less than the magnitude of the baseline constant for a number of sequential points. When a baseline region is found, this terminates a sequence of peaks. A zero reference line for peak height and area determination is established by extending a line from the point of the onset of the peak sequence to the point of the termination. The values of these two points are found by averaging the four integrated points just prior to the onset point and just after the termination points respectively.

The zero reference line will, in general, be non-horizontal and thus compensates for any linear drift in the system from the time the peak sequence starts until it ends. In a single peak situation, peak area is the area of the component peak between the curve and the zero reference line. The peak height is the distance from the zero reference line to the maximum point on the component curve. The value and location of the maximum point is determined from quadratic interpolation through the three highest points at the peak of the discrete valued curve stored in 2350A. This interpolation technique is used both for peaks as well as valleys (minimum points) in fused peak sequences. In the latter case, lines are dropped from the interpolated valley points to the zero reference line to partition the fused peak areas into individual peaks. The use of quadratic interpolation improves both area and height calculation accuracy and eliminates the effects of variations in the integration factor on these calculations.

While calibrating, the controller may run several analyses of the calibration stream. Using entries from an example program, five analyses would be run. Since only the last three are to be averaged, data from runs one and two are not saved. Results are stored on the third run. Data from runs four and five are added to that stored for run three.

## C.3 ANALYSIS COMPUTATIONS

There are two basic analysis algorithms included in the controller:

- Area Analysis – calculates area under component peak
- Peak Height Analysis – measures height of component peak

## C.3.1 CONC. ANALYSIS WITH RESPONSE FACTOR

### Calibration

The concentration calculations discussed as follows require a unique response factor for each component in an analysis. These factors may be manually entered by an operator or automatically calculated by calibrating the system.

*Equation C-1 Response Factor Calculation*

$$ARF_n = \frac{Area_n}{Cal_n} \quad \text{or} \quad HRF_n = \frac{Ht_n}{Cal_n}$$

**NOTICE**

**Equation C-1 uses an external standard.**

where

| | |
|---|---|
| $ARF_n$ | area response factor for component “n” in area per mole percent (%) |
| $HRF_n$ | height response factor for component “n” |
| $Area_n$ | area associated with component “n” in calibration gas |
| $Ht_n$ | height associated with component “n” in mole percent in calibration gas |
| $Cal_n$ | amount of component “n” in mole percent of calibration gas |

Calculated response factors are stored by the controller for use in the concentration calculations, and are printed out in the configuration and calibration reports.

*Equation C-2 Average Response Factor*

$$RFAVG_n = \frac{\sum_{i=1}^{k} RF_i}{k}$$

where

| | |
|---|---|
| $RFAVG_n$ | area or height average response factor for component "n" |
| $RF_i$ | area or height response factor for component "n" from the calibration run |
| k | number of calibration runs actually used to calculate the response factors |

The percent deviation of new RF average from old RF average is calculated in the following manner:

*Equation C-3 Percent Deviation*

$$deviation = \left[\frac{RFnew - RFold}{Rfold} \times 100\right]$$

where the absolute value of percent deviation for alarm has been previously entered by the operator.

### Calc. in Mole Percent w/o Normalization

Once response factors have been determined by the controller or entered by the operator, component concentrations are determined for each analysis using the following equations:

*Equation C-4 Response Factor Calculation*

$$CONC_n = \frac{Area_n}{ARF_n} \quad \text{or} \quad CONC_n = \frac{Ht_n}{HRF_n}$$

where

| | |
|---|---|
| $CONC_n$ | concentration of component "n" in mole percent |
| $AREA_n$ | area of component "n" in unknown sample |
| $ARF_n$ | response factor of component "n" calculated from area of calibration sample. Units are area per mole percent |
| $Ht_n$ | peak height of component "n" in unknown sample |
| $HRF_n$ | response factor of component "n" calculated from peak height of calibration sample. Units are height per mole percent |

Note that the average concentration of each component will also be calculated when data averaging is requested.

Component concentrations may be input through analog inputs 1 to 4 or may be fixed. If a fixed value is used, the calibration for that component is the mole percent that will be used for all analyses:.

*Equation C-5 Concentration Calculations with Normalization*

$$CONCN_n = \frac{CONC_n}{\sum_{i=1}^{k} CONC_i} \times 100$$

where

| | |
|---|---|
| $CONCN_n$ | normalized concentration of component "n" in percent of total gas concentration |
| $CONC_n$ | non-normalized concentration of component "n" in mole percent |
| $CONC_i$ | non-normalized concentration (in mole percent) from each of the "k" components to be grouped into this normalization |
| k | number of components to be included in the normalization |

## C.4 POST ANALYSIS COMPUTATIONS

### C.4.1 Liquid Equivalent Computations

The equivalent liquid volume, in gallons per 1000 standard cubic feet (GPM) is given by:

*Equation C-6 Equivalent Liquid Volume (GPM)*

$$GPM_n = CONCN_n \times LCF_n \times \frac{BASEPRS}{14.73} \times \frac{BASETEMP + 459.67}{60 + 459.67}$$

where

| | |
|---|---|
| $GPM_n$ | gallons/1000 standard cubic feet of component "n" |
| $CONCN_n$ | normalized (if selected) concentration of component "n" |
| $LCF_n$ | liquid equivalent conversion factor for component "n" at 14.73 PSIA and 60 degrees F |
| BASE PRS | base (contact) Pressure specified; defaults to 14.73 |

### C.4.2 Heating Value Calculations

*Equation C-7 Dry Gross BTU Value of Total Gas*

$$DRYBTU|CF = \frac{\sum_{n=1} [(CONCN)_n (BTU|CF)_n]}{100}$$

where

| | |
|---|---|
| DRYBTU/CF | uncorrected dry BTU content per cubic foot of total gas sample |
| $CONCN_n$ | normalized (if selected) concentration of component "n", calculated from peak analysis |
| $BTU/CF_n$ | energy content per cubic foot of component "n", stored in permanent memory |
| P | total number of components to be used in calculation of total BTU/CF |
| "100" | removed the "100" factored into the calculation of the concentration earlier in the analysis |

*Equation C-8 Ideal Relative Density of Total Gas Sample*

$$TOTALRD = \frac{\sum_{n=1} CONC_n(RD_n)}{100}$$

where

| | |
|---|---|
| $RD_n$ | relative Density of component "n" |
| TOTAL RD | relative Density of total gas sample |
| $CONCN_n$, P, 100 | are defined in "1." preceding |

The ideal gas relative density, DI is corrected to the real gas relative Density, Dr, by dividing by the compressibility factor, Z, for gas mixture at 60 $^{o}$F and one atmosphere pressure and multiplying by the compressibility factor of air at the same conditions:

*Equation C-9 Real Gas Relative Density*

$$D_R = \frac{D_I Z_{b(air)}}{Z_{b(gas)}}$$

where

$D_I$ ideal gas relative density (see Appendix B)

$Z_{b(air)}$ compressibility factor of air, or 0.99959

$Z_{b(gas)}$ compressibility factor of gas mixture

Compressibility uses calculations from AGA Report No. 8 (1992) errata (1993) “Compressibility Factors of Natural Gas and other related Hydro-Carbon Gases”.

*Equation C-10 Corrected Dry BTU Value*

$$CORRDRYBTU = \frac{DRYBTU}{Z}$$

where

DRYBTU value from Equation C-7

Z compressibility factor (see Equation C-9)

BASE PRS base (contract) pressure specified; defaults to 14.73 PSIA

*Equation C-11 Corrected Saturated BTU Value of Total Gas*

$$CORRSATBTU = \frac{(DRYBTU)(0.9826)}{Z}$$

where

| | |
|---|---|
| DRYBTU | value from Equation C-7 |
| CORRSATBTU | corrected saturated BTU content per cubic foot of total gas sample at base conditions of BASE PRS and 60 °F |
| Z | compressibility of total gas as calculated in Equation C-9 |
| BASEPRS | base (contract) pressure specified; defaults to 14.73 PSIA |

Note that the BTU calculations apply to Gross dry, saturated, actual BTU and Net dry, saturated, and actual BTU

*Equation C-12 BTU Calculations*

$$GrossActualBTU(corr) = GrossDryBTU(corr) \times \left(100 - \frac{(WVC)}{100}\right)$$

where

| | |
|---|---|
| WVC | Water volume content (provided by a “live analog input” |

*Equation C-13 Wobbe Index Calculation*

$$WI = \frac{CORR(GROSS)BTU}{\sqrt{RD}}$$

where

| | |
|---|---|
| W.I. | Wobbe index value |
| CORRGROSSBTU | Corrected Dry BTU for total gas Sample as calculated in Equation C-10 |
| RD | real Relative Density as calculated in Equation C-9 |

*Equation C-14 Weight Percent Calculation*

$$WTpercent_n = \frac{(CONC_n)(MW_n)}{\sum_{i=1}^{k}(CONC_i)(MW_i)} \times 100$$

**NOTICE**

**All components in the sample must be measured in order to calculate weight percent.**

where

| | |
|---|---|
| $WTpercent_n$ | weight percent of component “n” |
| $CONC_n$ | concentration in mole percent of component “n” |
| $Mw_n$ | molecular weight of component “n” |
| $\sum_{i=1}^{k}$ | sum of weights of all components in sample |

*Equation C-15 Average Molecular Weight*

$$AVGMW = \sum_{i=1}^{k}(CONC_i)(MW_i)$$

where

| | |
|---|---|
| AVGMW | average molecular weight |
| $\sum_{i=1}^{\kappa}$ | sum of weights of all components in sample |

*Equation C-16 Liquid Volume Percent*

$$LVpercent = \frac{(WTpercent_n) \div (D_n)}{k} \times 100$$
$$\sum_{i=1} (WTpercent_i) \div (D_i)$$

where

| | |
|---|---|
| LV percent | liquid volume |
| WT percent | weight percent |
| D | density |
| $\sum_{i=1}^{\kappa}$ | sum of all components in sample |

**NOTICE**

**All components in the sample must be measured in order to calculate liquid volume percent from mole percent.**

*Equation C-17 Reid Vapor Pressure*

$$RVP = \frac{\sum_{i=1}^{\kappa} (CONC_i)(VP_i)}{100}$$

where

| | |
|---|---|
| RVP | reid vapor pressure |
| $CONC_i$ | normalized concentration of component "i" in mole percent |
| $VP_i$ | vapor pressure at 100 F of component "i" (GPA2145 = 94) |

**NOTICE**

**All components in the sample must be measured to calculate LRDT.**

*Equation C-18 Liquid Relative Density*

$$LRD_T = \frac{\sum_{i=1}^{n} (LVpercent_i)(LRD_i)}{100}$$

where

| | |
|---|---|
| $LRD_T$ | liquid relative density of sample, relative to water at 60 °F |
| $LRD_i$ | liquid relative density of component "i" (GPA2145-94) |
| LVpercent | liquid volume percent from Equation C-17 |

*Equation C-19 Liquid Density*

$$LD_T = \frac{\sum_{i=1}^{n} (LV_i)(LD_i)}{100}$$

**NOTICE**

**All components on sample must be measured to calculate Liquid Density.**

where

| | |
|---|---|
| $LD_T$ | liquid density of total sample in pounds per gallon |
| $LD_i$ | liquid density of component "i". (GPA 2145-94) |
| $LV_i$ | liquid volume percent |

*Equation C-20 Gas Density*

$$GD = (RD)(76.4976)$$

where

| | |
|---|---|
| GD | gas density in lb/1000 $ft^3$ |
| RD | relative density (relative to air) |
| 76.4976 | density of air at 14.73 PSIA and 60 °F, in lb/1000 $ft^3$ |

### C.4.3 Multi-Level Calibration

The properties of each gas component can be viewed using the Component Data menu. Included with the component properties in the Component Data Table are four coefficients labeled Multi-Level Calib 'a', 'b', 'c', and 'd' for each component. If these parameters are all zero, then linear calibration is used. See Section C.3.1 for the response factor calculations.
If any of these parameters have a value other than zero, then multi-level, or polynomial calibration is used for that component.
The response factors are then calculated as:

*Equation C-21 Multi-Level Calibration*

$$ResponseFactor = \frac{aP^3 + bP^2 + cP + d}{CalibrationConcentration} \ (mol\ \%)$$

where

| | |
|---|---|
| P | peak size (Area or Height as selected by the Operator); from average calibration runs |
| Coefficients: A,B,C, and D | Calculated Offline. Entered after Multi-Level Calibration using several calibration gases (typically seven gases) |

1. **Note: If the coefficient values are correct values, the response factor will be close to one.**

The mole% value in the sample gas is then calculated as

*Equation C-22 Mole% Value*

$$Mole\ \% = \frac{aP^3 + bP^2 + cP + d}{responsefactor}$$

where

| | |
|---|---|
| P | peak size measured in Sample Gas |

### C.4.4 Indirect Calibration

Component gases which are **NOT** found in the calibration gas, but may be found in the sample gas, can be assigned a response factor which is a fixed multiple (the Relative Response Factor to a Reference Component) that **IS** found in the calibration gas.

The Relative Response Factors and Reference Component Values are included in the Component Data Table (following the Multi-Level Calibration coefficients) See Appendix B.

If the Reference Component is **None**, then normal (direct) calibration is used.

If the Reference Component is defined, (e.g. Propane) then the mole% value for the indirect component (e.g. neoC5), is calculated as:

*Equation C-23 Mole% Value Indirect Component*

$$mole\%\ (neoC5) = mole\%\ (Propane) \left(\frac{P(neoC5)}{P(Propane)}\right)(RRFneoC5)$$

where

| | |
|---|---|
| P | peak size |
| RRF | Relative Response Factor |

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# APPENDIX D, ANALOG OUTPUT CAL. FOR 2350A

The initial analog output adjustment will be set at the factory before shipment at standard values (4-20 mA or 1-5 V). It may be necessary to check and/or adjust these values, depending on output cabling or impedance. The adjustment may require two persons if the units are some distance apart. It will require a good digital meter to check the zero and full scale values at the receiving end. The scale or span value can be adjusted by a PC with MON2000 software when the values are known at the receiving end.

**NOTICE**

**The 4-20 mA outputs are calibrated similarly except the current is measured instead of the voltage.**

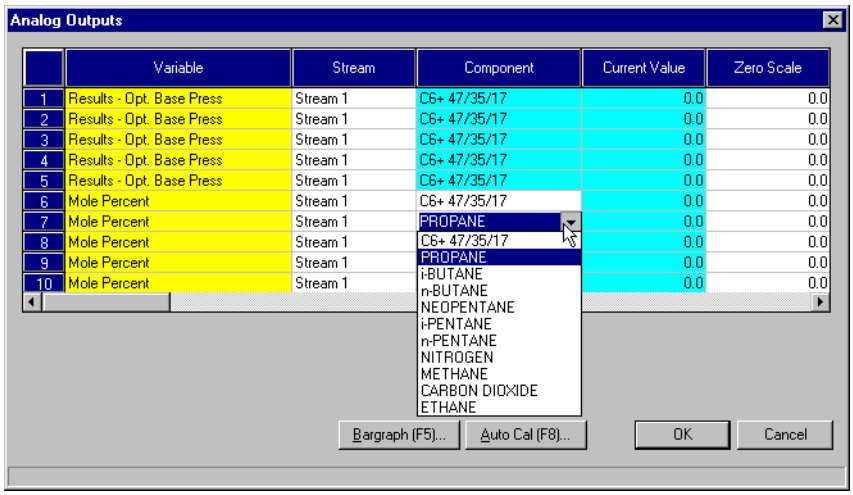
It is possible to calibrate the analog outputs using different engineering units. Two examples are described below using both volts and percentages.

## D.1 CALIBRATING BY VOLTS

This example assumes that an analog output channel needs to calibrated to a span of 1-5 V.

To calibrate an analog output by adjusting the voltage,

1. Use the *Application* > *Analog Outputs* menu to access this function.
2. The Analog Outputs dialog appears.


Analog Outputs
Variable
Stream
Component
Current Value
Zero Scale
1 Results - Opt. Base Press Stream 1 C6+ 47/35/17 0.0 0.0
2 Results - Opt. Base Press Stream 1 C6+ 47/35/17 0.0 0.0
3 Results - Opt. Base Press Stream 1 C6+ 47/35/17 0.0 0.0
4 Results - Opt. Base Press Stream 1 C6+ 47/35/17 0.0 0.0
5 Results - Opt. Base Press Stream 1 C6+ 47/35/17 0.0 0.0
6 Mole Percent Stream 1 C6+ 47/35/17 0.0 0.0
7 Mole Percent Stream 1 PROPANE 0.0 0.0
8 Mole Percent Stream 1 0.0 0.0
9 Mole Percent Stream 1 0.0 0.0
10 Mole Percent Stream 1 0.0 0.0
C6+ 47/35/17
PROPANE
i-BUTANE
n-BUTANE
NEOPENTANE
i-PENTANE
n-PENTANE
NITROGEN
METHANE
CARBON DIOXIDE
ETHANE
Bargraph (F5)...
Auto Cal (F8)...
OK
Cancel

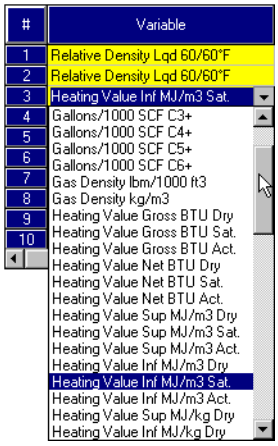
3. Select the channel to be calibrated.

   Output channels 1 and 2 can be scaled from either 4-20 mA or 1-5 V. Channels 3 to 10 are scaled from 4-20 mA.

**CAUTION**

**Although output channels for direct voltage measurement exist for analog output channels 1 and 2, it is recommended that they *not* be used for calibration purposes. Instead, use the current-out terminals and the 250-ohm resistor as described.**

4. To change a variable assignment, click the appropriate Variable cell. Use the provided pull-down menu and click the desired variable to select it.


#
Variable
1 Relative Density Lqd 60/60°F
2 Relative Density Lqd 60/60°F
3 Heating Value Inf MJ/m3 Sat.
4 Gallons/1000 SCF C3+
5 Gallons/1000 SCF C4+
6 Gallons/1000 SCF C5+
7 Gallons/1000 SCF C6+
8 Gas Density lbm/1000 ft3
9 Gas Density kg/m3
10 Heating Value Gross BTU Dry
Heating Value Gross BTU Sat.
Heating Value Gross BTU Act.
Heating Value Net BTU Dry
Heating Value Net BTU Sat.
Heating Value Net BTU Act.
Heating Value Sup MJ/m3 Dry
Heating Value Sup MJ/m3 Sat.
Heating Value Sup MJ/m3 Act.
Heating Value Inf MJ/m3 Dry
Heating Value Inf MJ/m3 Sat.
Heating Value Inf MJ/m3 Act.
Heating Value Sup MJ/kg Dry
Heating Value Inf MJ/kg Dry

5. For voltage values, set *Zero Scale* to "1.0" and *Full Scale* to "5.0".

   If the channel is calibrated in milliamperes, set *Zero Scale* to "4" and *Full Scale* to "20".

6. Set the *Fixed/Var* parameter to "Fixed".
7. Set the *Fixed Value* to "0.0".
8. Set *Zero Scale Adjustment* and the *Full Scale Adjustment* to "0.0".
9. Click the OK button to accept your changes and exit from the Analog Outputs dialog.
10. Connect a 250-ohm resistor across the signal at the input of the device where this analog output is used. Connect a Voltmeter across the resistor and measure the result.
11. Return to the Analog Outputs dialog and reselect the channel being calibrated.
12. Set the *Fixed Value* to the Full Scale value entered in Step 5.

**NOTICE**

**Your Voltmeter reading should be close to 1.0 V but does not have to be exactly 1.0 V. If the reading is negative, reverse the leads.**

13. Click the OK button to accept your changes and exit from the Analog Outputs dialog.
14. Look at the voltmeter again and record the full scale reading.
15. Return to the Analog Outputs dialog and reselect the channel being calibrated.
16. Change the *Zero Scale Adjustment* to the Zero Scale voltage reading and the *Full Scale Adjustment* to the Full Scale voltage reading.
17. Click the OK button to accept your changes and exit from the Analog Outputs dialog.
18. Return to the Analog Outputs dialog and reselect the channel being calibrated.
19. To quickly verify your changes, enter the midpoint of your range (e.g., 3) for the *Fixed Value*. Click the OK button to accept your change. The resulting voltage output should be close to span midpoint (e.g., 3).
20. Return to the Analog Outputs dialog and reselect the channel being calibrated.
21. Set the *Fixed/Var* parameter to "Var" and the *Fixed Value* to "0.0".
22. Click the OK button to accept your changes.

The voltage output could change slightly from time to time and the MON2000 software will now maintain the correct span.

**NOTICE**

**Your voltmeter reading should be very close to 5.0 Volts. MON2000 will adjust the scale so the span will be 4 Volts and scale accordingly.**

## D.2 CALIBRATING BY PERCENTAGES

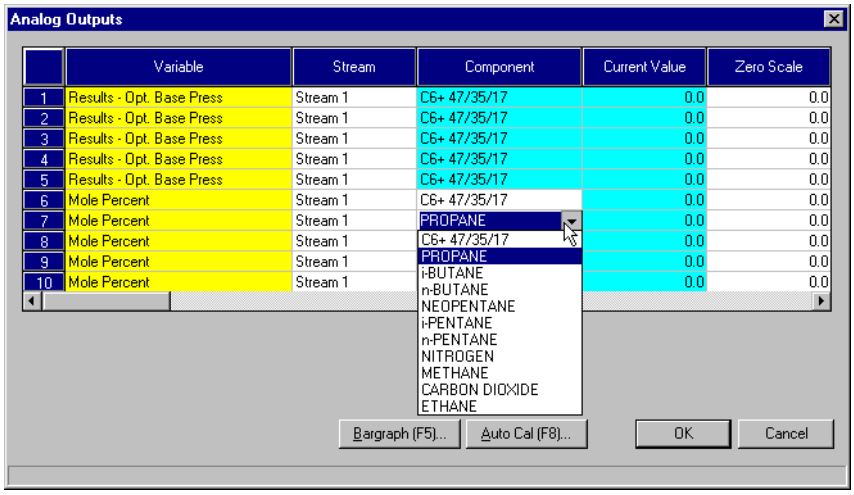
This second example, shown below, demonstrates that it is also possible to calibrate your outputs as a percentage. For instance, you may wish to read directly values that may be scaled from 0 to 1200. Your voltage span is scaled from 1 to 5 volts so the range is approximately 4 Volts. Thus, 1200 divided by 4 equals 300 units per volt. If you equate the difference as a percentage, the midpoint in units equals 600, or approximately 3 volts.

With this information in mind, you want to set zero units equal to 1.00 V and 1200 units to 5.00 V and let the software adjust the span as you calibrate.

This example assumes that an analog output channel needs to calibrated to a span of 0 to 1200.

To calibrate by percentages,

1. Use the *Application > Analog Outputs* menu to access this function.
2. The Analog Outputs dialog appears.


Analog Outputs
Variable
Stream
Component
Current Value
Zero Scale
1 Results - Opt. Base Press Stream 1 C6+ 47/35/17 0.0 0.0
2 Results - Opt. Base Press Stream 1 C6+ 47/35/17 0.0 0.0
3 Results - Opt. Base Press Stream 1 C6+ 47/35/17 0.0 0.0
4 Results - Opt. Base Press Stream 1 C6+ 47/35/17 0.0 0.0
5 Results - Opt. Base Press Stream 1 C6+ 47/35/17 0.0 0.0
6 Mole Percent Stream 1 C6+ 47/35/17 0.0 0.0
7 Mole Percent Stream 1 PROPANE 0.0 0.0
8 Mole Percent Stream 1 C6+ 47/35/17 0.0 0.0
9 Mole Percent Stream 1 PROPANE 0.0 0.0
10 Mole Percent Stream 1 i-BUTANE 0.0 0.0
n-BUTANE
NEOPENTANE
i-PENTANE
n-PENTANE
NITROGEN
METHANE
CARBON DIOXIDE
ETHANE
Bargraph (F5)...
Auto Cal (F8)...
OK
Cancel

3. Select the channel to be calibrated.

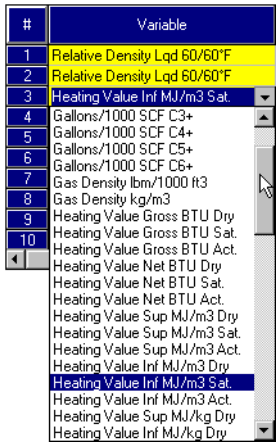
   Output channels 1 and 2 can be scaled from either 4-20 mA or 1-5 V. Channels 3 to 10 are scaled from 4-20 mA.

**CAUTION**

**Although output channels for direct voltage measurement exist for analog output channels 1 and 2, it is recommended that they *not* be used for calibration purposes. Instead, use the current-out terminals and the 250-ohm resistor as described.**

All can be scaled with a percentage.

4. To change a variable assignment, click the appropriate Variable cell. Use the provided pull-down menu and click the desired variable to select it.


#
Variable
1 Relative Density Lqd 60/60°F
2 Relative Density Lqd 60/60°F
3 Heating Value Inf MJ/m3 Sat.
4 Gallons/1000 SCF C3+
5 Gallons/1000 SCF C4+
6 Gallons/1000 SCF C5+
7 Gallons/1000 SCF C6+
8 Gas Density lbm/1000 ft3
9 Gas Density kg/m3
10 Heating Value Gross BTU Dry
Heating Value Gross BTU Sat.
Heating Value Gross BTU Act.
Heating Value Net BTU Dry
Heating Value Net BTU Sat.
Heating Value Net BTU Act.
Heating Value Sup MJ/m3 Dry
Heating Value Sup MJ/m3 Sat.
Heating Value Sup MJ/m3 Act.
Heating Value Inf MJ/m3 Dry
Heating Value Inf MJ/m3 Sat.
Heating Value Inf MJ/m3 Act.
Heating Value Sup MJ/kg Dry
Heating Value Inf MJ/kg Dry

5. Set *Zero Scale* to "0" and *Full Scale* to "1200".
6. Set the *Fixed/Var* parameter to "Fixed".
7. Set *Fixed Value* to "0.0".
8. Set *Zero Scale Adjustment* and *Full Scale Adjustment* to "0.0".
9. Click the OK button to accept your changes and exit from the Analog Outputs dialog.
10. Connect a 250-ohm resistor across the signal at the input of the device where this analog output is used. Connect a Voltmeter across the resistor and measure the result.
11. Return to the Analog Outputs dialog and reselect the channel being calibrated.
12. Set the *Fixed Value* to the Full Scale value entered in Step 5.

**NOTICE**

**Your Voltmeter reading should be close to 1.0 V but does not have to be exactly 1.0 V. If the reading is negative, reverse the leads.**

13. Click the OK button to accept your changes and exit from the Analog Outputs dialog.
14. Look at the voltmeter again and record the full scale reading.
15. Return to the Analog Outputs dialog and reselect the channel being calibrated.
16. Change the *Zero Scale Adjustment* to the zero scale voltage reading and the *Full Scale Adjustment* to the full scale voltage reading.
17. Click the OK button to accept your changes and exit from the Analog Outputs dialog.
18. Return to the Analog Outputs dialog and reselect the channel being calibrated.
19. To quickly verify your changes, enter the midpoint of your range (e.g., 600) for the *Fixed Value*. Click the OK button to accept your change. The resulting voltage output should be close to span midpoint (e.g., 3).
20. Return to the Analog Outputs dialog and reselect the channel being calibrated.
21. Set the *Fixed/Var* parameter to "Var" and the *Fixed Value* to "0.0".
22. Click the OK button to accept your changes.

The voltage output could change slightly from time to time and the MON2000 software will now maintain the correct span.

**NOTICE**

**Your voltmeter reading should be very close to 5.0 Volts. MON2000 will adjust the scale so the span will be 4 Volts and scale accordingly.**

# APPENDIX E, UPGRADE 2350A GC S/W AND 2350 EPROMS

**CAUTION**

**To upgrade the Model 500 2350A (GC) software and the 2350 EPROMs, perform all steps in the order they appear in this appendix.**

**Before beginning the upgrade procedure, ensure that you have identified which standard (i.e., factory-released) application file was used to form the current user application for this GC. See Section E.10 for more information on standard applications.**

## E.1 CONNECT TO GC AND HALT ANALYSIS

1. Ensure that the MON2000 software is running and you are connected to the GC that is to be upgraded.

   Use the *File* > *Connect* menu to access this function. See Section 2.8.1 for more information.

2. Use MON2000 to halt any ongoing analysis or calibration runs.

   Use the *Control* > *Halt* menu to access this function. See Section 4.3 for more information.

**NOTICE**

**When halted GC runs have finished, the status for Detector 1 mode will indicate Idle (see GC Status bar; see Section 3.3).**

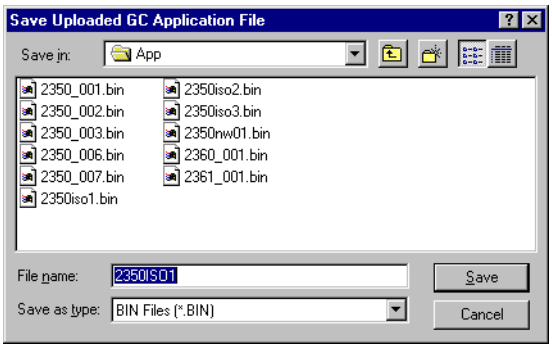
## E.2 OFFLINE EDIT TO UPLOAD APP. & RENAME

1. Use MON2000 to upload (from the GC unit) to the PC the most current parameters that are in use at the GC.

   Use the *File* > *Offline Edit* > *Upload Application* menu to access this function.

2. A menu of stored application files appears. Double-click the desired file.

3. The Save Uploaded GC Application File dialog appears.




Use this dialog to assign a new file name to the GC Application file that is the target for uploading.

For clarity, you could name this file "OLD.bin" to distinguish it from the upgraded application file.

Press the ENTER key or click the Save button to continue.

**NOTICE**

**The existing file name of the GC application file for the connected GC displays in the *File name* field.**

4. The Upload Application process begins. This process usually takes about 15 minutes to complete.

   MON2000 automatically disconnects from the GC after the Upload Application process has finished.

5. Use the *File* > *Exit* menu to close MON2000.

   Or, you can exit MON2000 by pressing the ALT-F X keys, or click the ✕ button on the main window.

## E.3 UPGRADE USER-DEFINED APPLICATIONS

Follow the installation instructions provided in Section 2.2 to upgrade the MON2000 software and/or a standard application file.

**CAUTION**

**Do not delete any existing MON2000 program or GC application files from the PC hard drive. The upgrade process uses information from these files and automatically overwrites any outdated program file.**

Use the Update BIN utility that is installed with the MON2000 software to upgrade a GC application that contains user-defined data (such as components). The Update BIN program allows you to upgrade an application that is either on disk or "live" at the GC Controller. See the following sections for details.

## E.4 UPGRADE FROM DISK

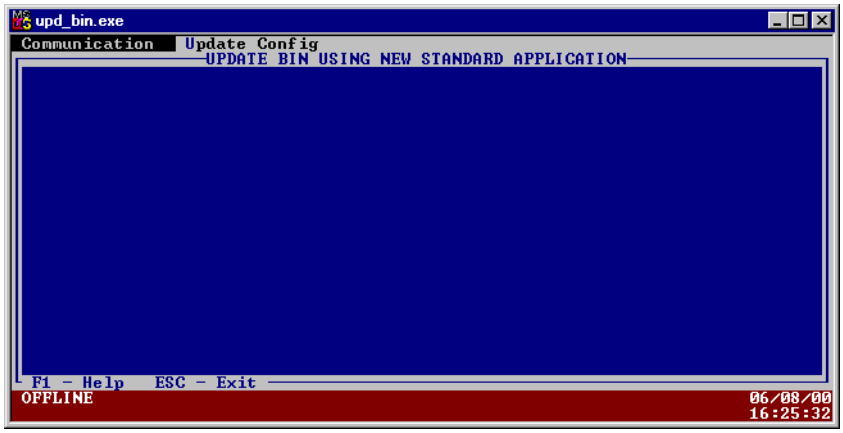
To upgrade a user-defined application file (*.BIN) located on your PC hard drive or on a floppy disk,

**CAUTION**

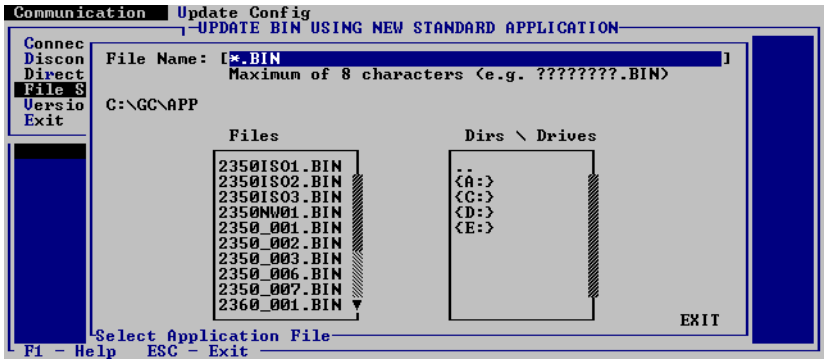
**It is recommended that you save a copy of your application file before performing the upgrade.**

1. Launch the Update BIN software by either:
   - clicking the Start button and using the *Programs* >MON2000 > *Update BIN* menu
   - double-clicking the Update BIN icon on your PC desktop

2. The Update BIN software program launches inside a DOS window.



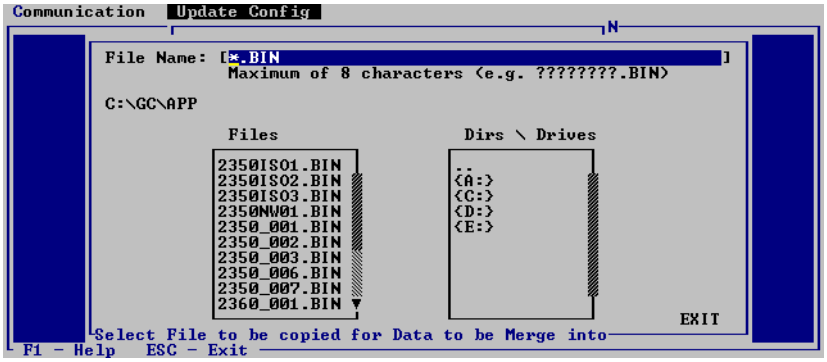

3. Press the TAB key to access the Communication menu.
4. Use the ARROW keys to select the *File Selection* option, and then press ENTER.
5. The File Selection screen displays.



Use the TAB and ARROW keys to select the desired application file from disk. This file is the file you will be upgrading.

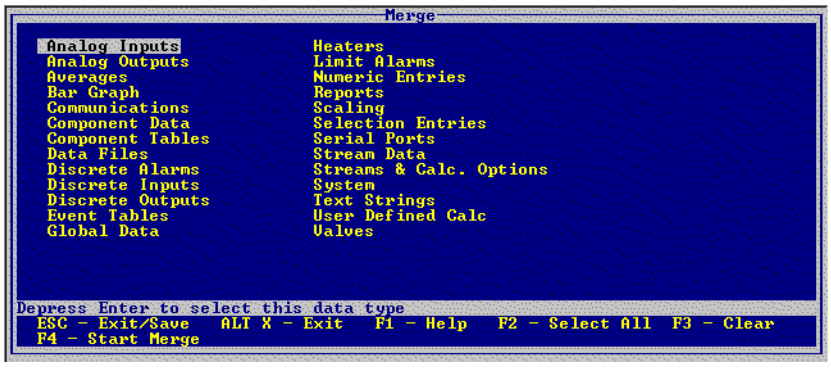
6. Press the TAB key to access the Upgrade Config menu.
7. Use the ARROW keys to select the *Merge* option, and then press ENTER.

8. The File Selection screen displays.




Use the TAB and ARROW keys to select the desired application file from disk. This file is the new application file you wish to merge into the existing file (see Step 5).

9. The Merge screen displays.



10. Use the ARROW+ENTER keys to select the desired application settings to upgrade.

    Press the SHIFT + ENTER keys to select multiple settings.

    Press the F2 key to select all the available settings.

    Press the F3 key to clear your selected settings.

11. Press the F4 key to begin the upgrade.

12. When the upgrade is done, press the ESC key or use the *Communication* > *Exit* menu to close the Update BIN program.

    Ensure that you inspect the upgraded application file for any errors.

### E.4.1 Upgrade from GC Controller

To upgrade a user-defined application file (*.BIN) currently being used by the GC Controller,

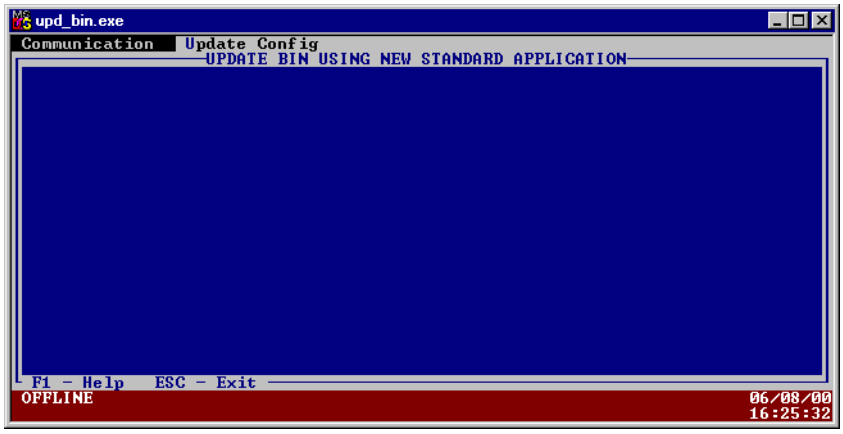
**CAUTION**

**It is recommended that you upload a copy of your application file before performing the upgrade.**

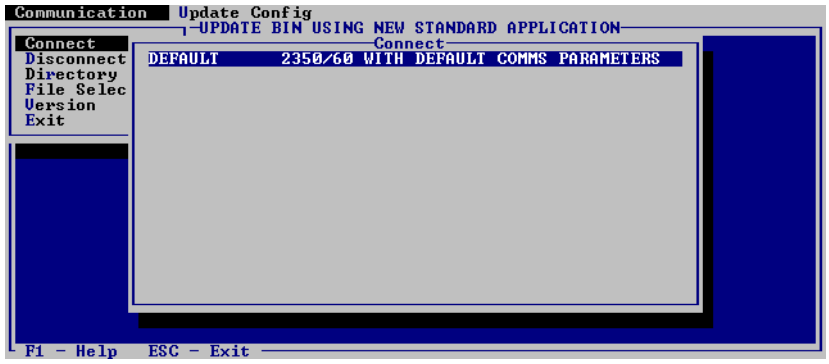
1. Launch the Update BIN software by either:

   - clicking the Start button and using the *Programs* >MON2000 > *Update BIN* menu
   - double-click the Update BIN icon on your PC desktop

2. The Update BIN software program launches inside a DOS window.



3. Use the ARROW keys to select the *Connect* option, and then press ENTER.
4. The Connect screen displays, listing the available GC units.

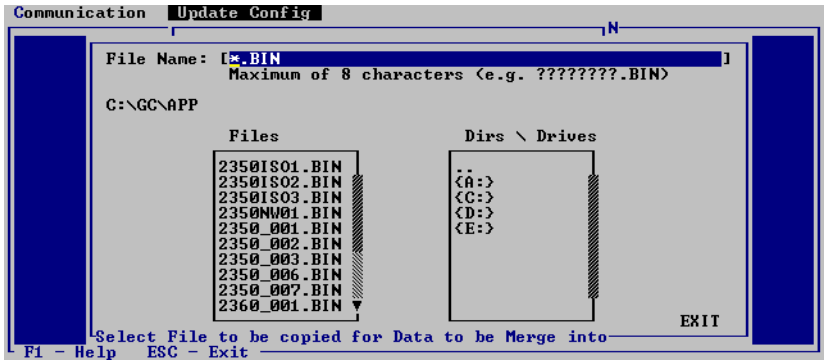



Use the ARROW keys to select the appropriate GC, and then press ENTER.

5. Update BIN attempts to connect to the GC Controller.

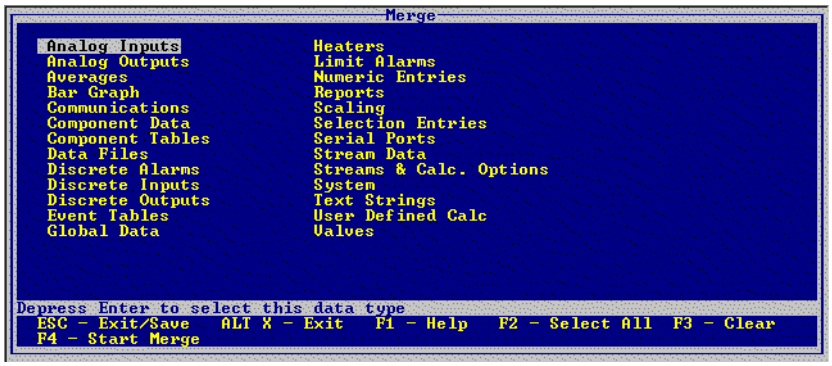
   If the attempt fails, see Section E.4.2 for information on configuring the communications parameters for Update BIN.

6. The File Selection screen displays.




Use the TAB and ARROW keys to select the desired application file from disk. This file is the new application file you wish to merge into the existing file (see Step 5).

7. The Merge screen displays.




8. Use the ARROW+ENTER keys to select the desired application settings to upgrade.

   Press the SHIFT + ENTER keys to select multiple settings.

   Press the F2 key to select all the available settings.

   Press the F3 key to clear your selected settings.

9. Press the F4 key to begin the upgrade.

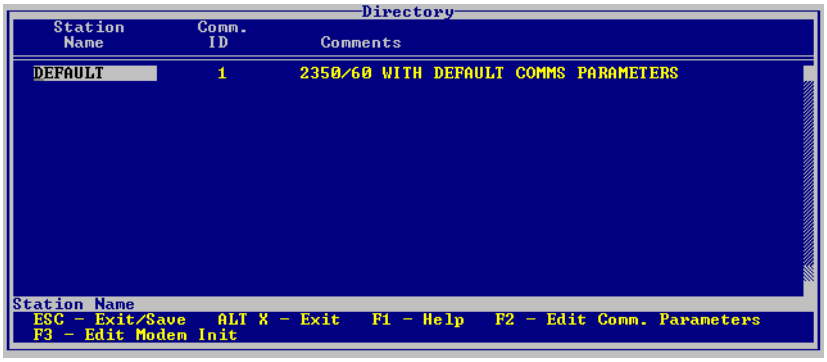
10. When the upgrade is done, use the *Communications* > *Disconnect* menu to cease communications with the GC unit.
11. Press the ESC key or use the *Communication* > *Exit* menu to close the Update BIN program.

    Ensure that you inspect the upgraded application file for any errors.

### E.4.2 Configure GC Connection

To configure the GC communications parameters for the Update BIN software,

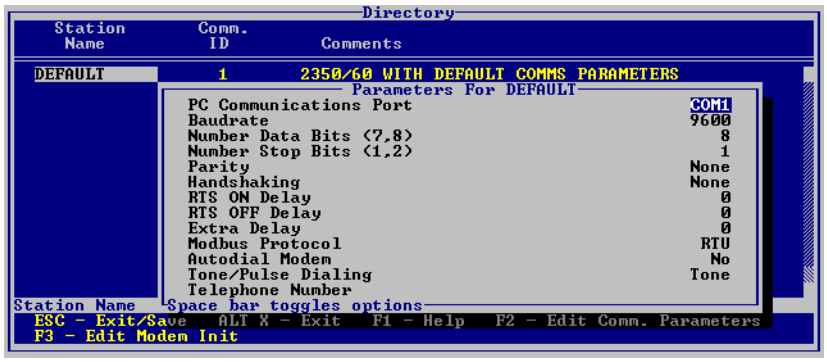
1. Use the *Communication* > *Directory* menu to access a list of communication settings for each GC unit.
2. The Directory screen displays.




3. Use the ARROW keys to select the desired GC unit and then press the F2 key to edit its communications parameters.

   You can also press F3 to edit the modem initialization string.

4. The Parameters screen displays.




5. Use the ARROW keys and space bar to select the desired parameter and toggle between its options.
6. Press the ENTER key to accept your changes or press the ESC key to cancel.

## E.5 DISCONNECT POWER AND DISASSEMBLE

**WARNING**

**PERSONELL AND EQUIPMENT**

**Failure to follow the instructions below, may cause injury to personnel or damage equipment.**

**Before you remove the cover from the GC Controller or access its internal electronics, switch OFF the AC power source to the GC Controller, either at the breaker box or the controlling power source switch.**

**Also, disconnect the AC power cord from J21 before continuing working on the unit.**

1. Disconnect AC power from the GC Controller.

   When you have access to the GC Controller Terminal Board (TB) for field wiring (accessed from the rear on rack-mount versions and behind the front cover of explosion-proof models) disconnect the AC power cord from J21 before continuing working on the unit.

2. For newer model 19-inch rack mount and retrofit GC Controllers, proceed as follows:

   (a) Remove the (right) side access panel that is secured to the chassis with four thumbscrews.

   (b) Unplug all cables connected to the boards in slots 2 through 6 of the Card Cage Assembly in order to access the SBC53 CPU Board.

   (c) Proceed to Step 3 below.

   For the explosion-proof GC Controller or older rack mount GC Controllers, proceed as follows:

   (a) Access the GC Controller Terminal Board for field wiring.

   On the explosion-proof GC Controller, remove outer housing bolts and lower the cover on its bottom hinge. The TB faces the front.

   On rack mount GC Controllers, the TB is exposed and faces the rear.

   (b) Loosen the six thumbscrews that secure the TB. Then gently unplug the TB from its mating DIN connectors at the back, top of the board.

   (c) Lower the TB down (held in place by its ground straps at the bottom of the board) in order to expose the Card Cage Assembly.

(d) Unplug the TB power supply cord from its connection at the Card Cage Assembly power supply.

(e) Loosen the four thumbscrews that secure the Card Cage Assembly to the chassis. Then remove the Card Cage Assembly away from its chassis mount so that it is easy to work on.

(f) Unplug all cables connected to the boards in slots 2 through 6 of the Card Cage Assembly in order to access the SBC53 CPU Board.

3. Remove the SBC53 CPU Board from slot number 2 (second from the top) of the Card Cage Assembly.

## E.6 REPLACE EPROMS/RESET CPU

1. For 2350 GC Controllers, locate the EPROMs that will be replaced: U18 and U19. They are near the card-connector edge of the SBC53 CPU Board.

**CAUTION**

**Carefully note which EPROMs are labeled ODD and EVEN and which sockets hold them:**

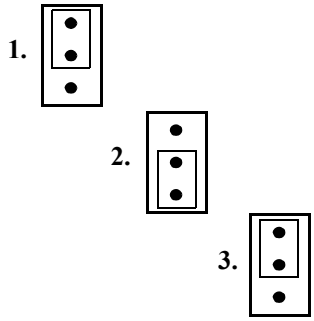
**socket U18 EVEN EPROM P/N 8-2350-001**

**socket U19 ODD EPROM P/N 8-2350-002**

2. Remove, one at a time, each of the old EPROMs, and replace each with its upgrade EPROM.

3. Locate Jumper Pin Set J14. It is near the two EPROMs you have just replaced.

   Note that Jumper Pin Set J14 has a single jumper shorting pins 1 and 2.



4. To reset the CPU registers, remove the jumper from J14 pins 1 and 2, and place it to short J14 pins 2 and 3.
5. After briefly shorting J14 pins 2 and 3, remove the jumper again. Place it back in its original position, shorting J14 pins 1 and 2.

## E.7 REASSEMBLY PROCEDURES

1. Place and securely plug the SBC53 CPU Board into slot number 2 of the Card Cage Assembly.
2. Reconnect all ribbon cables that were unplugged (see Section E.5).

   Because the ribbon cables are arranged in layers, it important to reconnect them in the order listed below:

*Table E-1 2350 GC Ribbon Cables to Connect*

| Part Number | System Interface Board connection | Cable Originating from Board |
|---|---|---|
| 3-2350-063 | J12 | SBC53 |
| 3-2350-052 | J9 | SBC53 |
| 3-2350-062 | J11 | SBC53 |
| 3-2350-051 | J4 | SBC53 |
| 3-2350-064 | J8 | DSPI/O |
| 3-2350-053 | J10 | DSPI/O |
| 3-2350-054 | J6 | RTI1281 |
| 3-2350-055 | J5 | RTI1281 |

3. Return and secure the Card Cage Assembly its original position in the chassis mounting. Tighten the four screws.
4. Return and secure the field wiring TB in its original position. Tighten the six screws.
5. Reconnect the AC power cord to J21 on the TB, and restore AC power to the 2350A GC Controller.

## E.8 SET-UP AND PROGRAMMING

The purpose of this procedure is to define the CMOS table set-up and programming requirements for the CPU assembly and DiskOnChip.

### E.8.1 Procedure

1. Install the blank DiskOnChip into socket U1 on the CPU assembly, noting the orientation of pin 1.
2. Plug the floppy drive cable into J10 on the CPU assembly and plug the board into the card cage.
3. Plug the keyboard cable into J1 on the CPU assembly.
4. Turn on the power. When the video displays on the monitor, press the DELETE button to access the CMOS setup window.
   (a) The Standard CMOS Setup window displays. Press the ENTER button.
   (b) Set time and date by either PAGE UP, PAGE DOWN, or by entering the appropriate number value. After making the desired change, press ENTER.

(c) Change Drive C:\ to NONE by pressing PAGE DOWN. Verify that Drive A:\ is the only selected drive. Press ESCAPE, F10 (to save changes), Y (to verify that you want the changes to be made), then ENTER.

5. The CPU assembly will reboot and displays the Systems Configuration window. The speaker on the CPU will chirp and the monitor will prompt:

   "ENTER NEW DATE (mm-dd-yy)". Press ENTER.

   "ENTER NEW TIME:". Press ENTER.

   The A:\> prompt is displayed. Verify that the programming disk is the current revision specified on the work order package and it insert into the floppy drive. Type **INSTALL**.

6. As the DiskOnChip is being programmed, the following information is displayed:

   A:\> SYS C:
   SYSTEM TRANSFERRED

   A:\>CD IMAGE
   A:\IMAGE>COPY *.*C:\
   BOS.EXE
   PME16.EXE
   SCANDISK.EXE
   SCANDISK.INI
   AUTOEXEC.BAT
   BOSCHECK.EXE
   6 FILE(S) COPIED

   A:\IMAGE>CD\

   A:\>
   A:\>

7. At the A:\> prompt, type **C**:, then ENTER.

8. Type **PME16**, then ENTER.

9. The Protected Mode Program screen displays. Verify that a "cold start - initial" message is displayed in the middle of the screen and LED D2 is blinking on the CPU assembly.
10. Press ESC to exit the program and power down.
11. Carefully remove the cable from J1 and J10 to prevent cracking the connector housing. Install the program label on the end of DiskOnChip opposite the serial number.

### E.8.2 Reprogramming the DiskOnChip

Reprogram the DiskOnChip using the following instructions.

1. Install either the programmed DiskOnChip into socket U1 on the CPU assembly (noting the orientation of pin 1) or install the complete CPU assembly into card cage.
2. Plug the floppy drive cable into J10 on the CPU assembly and the keyboard cable into J1 on the CPU assembly.
3. Turn on the power. The CPU assembly reboots and displays the Systems Configuration window. The speaker on the CPU will chirp and the monitor will prompt

   "ENTER NEW DATE (mm-dd-yy)". Press ENTER

   "ENTER NEW TIME:". Press ENTER.

   The A:\> prompt displays. Verify that the programming disk is the current revision specified on the work order package and insert into the floppy drive. Type **C**:, then ENTER to change to the 'C' drive.

4. After the C:\> prompt is displayed, type **ERASE *.***, then press ENTER. When prompted "ARE YOU SURE?" Type **Y**, then press ENTER.
5. At the C:\> prompt, type **DIR**, then press ENTER. Verify that only the Command.com file remains on the 'C:' drive, that the file size is 54,645 bytes, and that there are 16,105,472 bytes free.
6. Type **A:**, then ENTER to change back to the A:\ drive. Type **INSTALL**, then follow Steps 6 through 11 (see Section E.8.1).

### E.8.3 GC Reassembly

Use the following instructions to reassemble the GC Controller (CPU, PC/104 Bus and the Modem).

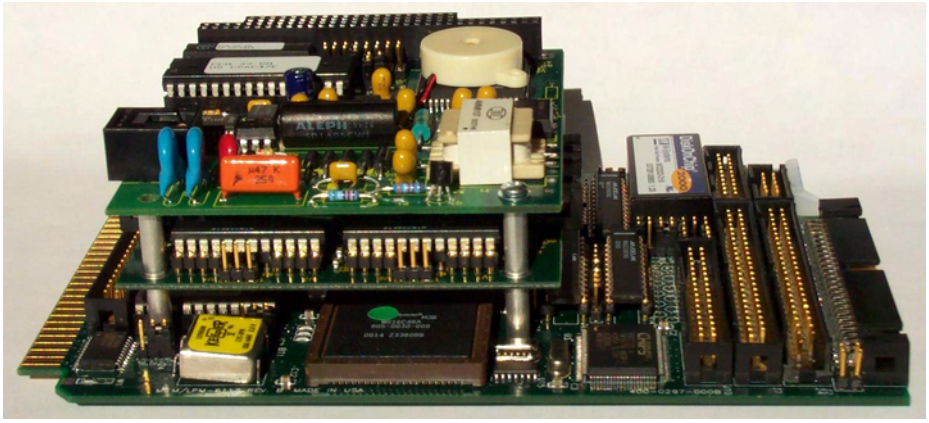


*Figure E-1 CPU, PC/104 and Modem*

1. Place and securely plug the WinSystems CPU Board into slot number 2 of the Card Cage Assembly.
2. Reconnect all ribbon cables that were unplugged.

3. Return and secure the Card Cage Assembly back into the chassis mounting. Tighten the four screws.
4. Return and secure the field wiring TB to the original position. Tighten the six screws.
5. Reconnect the AC power cord to J21 on the TB, and restore AC power to the GC Controller.

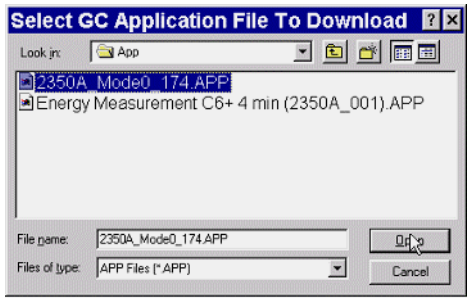
## E.9 CONNECT TO GC FOR UPGRADED APP.

1. Use MON2000 software to connect with the GC unit.

   Use the *File* > *Connect* menu to access this function. See Section 2.8.1 for more information.

2. Use MON2000 to download the newly upgraded GC application to the connected GC Controller.

   (a) Use the *File* > *Download* menu to access the Download CG Application File dialog.




   (b) Click the desired .bin file. The file name appears in the *File name* data field.

   (c) Click the Open button or press the ENTER key to download the selected application file to the connected GC unit. A progress bar displays, indicating the completion status.

## E.10 GUIDE TO STANDARD APPLICATION FILES

This section of the appendix lists the various standard application, or BIN files that have been released by for the GC Controller.

### E.10.1 Importance of Standard Application Files

After a new GC Controller has been loaded with a standard application, the standard application is customized by the entry of timed events, component table entries, and other operator entered information consistent with the performance characteristics of the chromatograph hardware to which the Controller is connected and the needs of the user. Thus the standard application becomes a user application and differs from the factory-released, standard application from which it originated.

At the time when software is upgraded, including application files, it becomes important to know which factory-released standard application formed the basis of the user application, so the user application can be upgraded, too, with newer version of the standard application file.

You can determine which standard application formed the basis of the current user application by inspecting various MON2000 screens while connected to the GC (in most cases, you need only inspect the System dialog).

### E.10.2 Standard Applications v1.50 and Later

If you are using a GC Application that is version 1.50 or later, you can quickly determine the original standard application name by viewing the variables listed in the System dialog.

Use the *Application* > *System* menu to access this dialog. In the System dialog, (see Table E-2) find the value for the variable named CFG Base Name, and locate it in the column labeled "CFG Base Name", then read the "Analyzer Name (BIN file)" to determine the application BIN file name.

*Table E-2 System Variables for Standard Application Files*

| Analyzer Name (BIN file) | Unit Type | CFG Base Name | System Description | Max. Archive Averages | Stream Sequence |
|---|---|---|---|---|---|
| 2350_001 | 2350 | USASTD1 | 2350 Standard 1, 64 avgs | 64 | 8 |
| 2350_002 | 2350 | USASTD2 | 2350 Standard 2, 32 avgs | 32 | 8 |
| 2350_003 | 2350 | USASTD3 | 2350 Standard 3, 128 avgs | 128 | 5 |
| 2350_006 | 2350 | USASTD6 | 2350 Std 6, 32 avgs, 10 strs | 32 | 10 |
| 2350_007 | 2350 | USASTD7 | 2350-7 12Str, 128 Avg, 260Mbus | 128 | 12 |
| 2350ISO1 | 2350 | ISOSTD1 | 2350 ISO Std 1, 64 avgs | 64 | 8 |
| 2350ISO2 | 2350 | ISOSTD2 | 2350 ISO Std 2, 32 avgs | 32 | 8 |
| 2350ISO3 | 2350 | ISOSTD3 | 2350 ISO Std 3, 128 avgs | 128 | 8 |
| 2350FI02 | 2350 | USSTDFILE02 | 12 stream with files | 204 | 12 |
| 2360_001 | 2360 | USADUAL1 | 2360 test application | 64 | 8 |
| 2350EXMB | 2350 | USSTDFILE01 | Extended Modbus 4 strm plus cal | 150 | 5 |
| 2360ISO1 | 2360 | ISODUALSTD1 | 2360 ISO Std 1, 64 avgs | 64 | 8 |

- **Standard BTU applications use the BIN files 2350_001, 2350_002, and 2350_003 for 64, 32, and 128 averages respectively.**
- **The Extended Modbus application uses BIN file 2350EXMB.**
- **The standard dual application uses BIN file 2360_001.**

### E.10.3 Standard Applications Prior to v1.50

For versions of GC Applications prior to version 1.50, the CFG Base Name variable did not exist. Therefore, a combination of other variables must be inspected to determine the standard application that was used to formulate the current user application.

To determine the standard application used to create a user application prior to version 1.50, compare the values of three variables from the System dialog - Unit Type, Max Archive Averages, and System Description — with the values found in Table E-2. You will also need to compare the maximum number of streams, which can be determined from the Streams option under the Application menu.

There is one more possible complication. If the variable System Description was edited, it may not be the same value as described earlier in Table E-2. In such an instance, it would be impossible to distinguish between the 2350_00n (i.e., USASTD1, USASTD2, and USASTD3) and 2350ISOn (i.e., ISOSTD1, ISOSTD2, and ISOSTD3) applications.

To overcome this complication, you can inspect one more variable:

1. Use the *Application> User Defined> Selection* menu to access the Selection dialog.
2. In the Selection dialog, CVTABLE_pri will be the first variable listed if the application is one of the ISO applications.

# APPENDIX F, MODBUS REG. LIST FOR 2350A GC

## F.1 INTRODUCTION – SIM_2251 & USER_MODBUS

GC Controller Modbus registers that may be of interest to the developer are of two varieties, SIM_2251 and User_Modbus. Differences are summarized in the following table.

*Table F-1 Comparison of SIM_2251 and User_Modbus*

| SIM_2251 | User_Modbus |
|---|---|
| Serial slave port. | Serial slave port. |
| Modified protocol that allows floating point numbers to be transmitted over Modbus via 2251 emulation slave type. | The standard Gould Modbus protocol that accommodates PLC Emulation LO-HI. |
| Nearly all register contents are predefined; a few 9000-series registers can be user-defined (i.e., read-write). | Boolean (coils) are predefined. Numeric (registers) are user-defined. |
| Variables assigned to registers can be listed in contents of a PC-Config Report (for instructions, see Section 2.14.3; for an example report, see Appendix A,). For more detail about register contents, see Section F.2.1. | Variables assigned to registers can be listed in contents of a PC-Config Report (for instructions, see Section 2.14.3; for an example report, see Appendix A,). Boolean (coils) contents also listed in Section F.2. |
| When using the Modbus Test software, set *Register Mode* to "DANIEL" to view register contents (see Section 10.2.3). | When using the Modbus Test software, set *Register Mode* to "PLC LH" to view register contents (see Section 10.2.3). |

### F.1.1 NOTES ON USER_MODBUS

Section F.2 lists only variables included in the User_Modbus Boolean Modbus registers. These registers are not user-defined and primarily contain alarm flags, possibly useful for debugging purposes. To use the Modbus Test software to view the contents of these registers, you will need to set the *Function* parameter to "1 (Read Coil)". See Section 10.2 through Section 10.4 for details on using the Modbus Test software.

All other User_Modbus registers can be defined by the user. To define User_Modbus register contents (through assignment of variables), see Section 5.16.4.

To obtain a complete list of register assignments, both SIM_2251 and User_Modbus, use Model 700 to produce a PC-Config Report.

**NOTICE**

**To print a PC-Config Report, see Section 2.14.3; for an example report, see Appendix A, Section F.2 and Section F.2.1.**

### F.1.2 NOTES ON SIM_2251 MODBUS

To use the Modbus Test software and view the contents of SIM_2251 registers, you will need to set Register Mode to "Daniel", as noted in Table F-1.

To obtain a complete list of register assignments, both SIM_2251 and User_Modbus, use MON2000 to produce a PC-Config Report.

## F.2 USER_MODBUS REGISTER LIST

Slave Name USER_MODBUS

| MODBUS Reg. | Variable Name | Field Name | Indices S | C | |
|---|---|---|---|---|---|
| Boolean (Coils) | | | | | |
| 0 | sysalarm_set | | 1 | 1 | Application Checksum Failure |
| 1 | sysalarm_set | | 2 | 1 | ROM Checksum Failure |
| 2 | sysalarm_set | | 3 | 1 | RAM Diagnostics Failure |
| 3 | sysalarm_set | | 4 | 1 | A/D Converter Failure |
| 4 | sysalarm_set | | 5 | 1 | Detector Oven Failure |
| 5 | sysalarm_set | | 6 | 1 | Liquid Sample Valve Heater Failure |
| 6 | sysalarm_set | | 7 | 1 | Sample System Oven Failure |
| 7 | sysalarm_set | | 8 | 1 | Catalytic Converter Failure |
| 8 | sysalarm_set | | 9 | 1 | Heater 5 Failure |
| 9 | sysalarm_set | | 10 | 1 | Heater 6 Failure |
| 10 | sysalarm_set | | 11 | 1 | Heater 1 Controller Failure |
| 11 | sysalarm_set | | 12 | 1 | Heater 2 Controller Failure |
| 12 | sysalarm_set | | 13 | 1 | Heater 3 Controller Failure |
| 13 | sysalarm_set | | 14 | 1 | Heater 4 Controller Failure |
| 14 | sysalarm_set | | 15 | 1 | Heater 5 Controller Failure |
| 15 | sysalarm_set | | 16 | 1 | Heater 6 Controller Failure |
| 16 | sysalarm_set | | 17 | 1 | FID Flame out |
| 17 | sysalarm_set | | 18 | 1 | Warmstart Calibration Failure |
| 18 | sysalarm_set | | 19 | 1 | Valve Timing Failure |
| 19 | sysalarm_set | | 20 | 1 | Excess Response Factor Deviation |
| 20 | sysalarm_set | | 21 | 1 | M200 Invalid Non-Volatile Data |
| 21 | sysalarm_set | | 22 | 1 | M200 Invalid A Module Data |
| 22 | sysalarm_set | | 23 | 1 | M200 Invalid B Module Data |
| 23 | sysalarm_set | | 24 | 1 | M200 Bad Options |
| 24 | sysalarm_set | | 25 | 1 | M200 Stack Overflow |
| 25 | sysalarm_set | | 26 | 1 | M200 Hardware Shutdown |
| 26 | sysalarm_set | | 27 | 1 | M200 Synchronization Failure |
| 27 | sysalarm_set | | 28 | 1 | Preamp Input 1 Out of Range |
| 28 | sysalarm_set | | 29 | 1 | Preamp Input 2 Out of Range |
| 29 | sysalarm_set | | 30 | 1 | Preamp Input 3 Out of Range |
| 30 | sysalarm_set | | 31 | 1 | Preamp Input 4 Out of Range |
| 31 | sysalarm_set | | 32 | 1 | Preamp Failure |
| 32 | sysalarm_set | | 33 | 1 | Analog Output 1 HIGH |
| 33 | sysalarm_set | | 34 | 1 | Analog Output 2 HIGH |
| 34 | sysalarm_set | | 35 | 1 | Analog Output 3 HIGH |
| 35 | sysalarm_set | | 36 | 1 | Analog Output 4 HIGH |
| 36 | sysalarm_set | | 37 | 1 | Analog Output 5 HIGH |
| 37 | sysalarm_set | | 38 | 1 | Analog Output 6 HIGH |
| 38 | sysalarm_set | | 39 | 1 | Analog Output 7 HIGH |
| 39 | sysalarm_set | | 40 | 1 | Analog Output 8 HIGH |
| 40 | sysalarm_set | | 41 | 1 | Analog Output 9 HIGH |

| | | | | |
|---|---|---|---|---|
| 41 | sysalarm_set | 42 | 1 | Analog Output 10 HIGH |
| 42 | sysalarm_set | 43 | 1 | Analog Output 11 HIGH |
| 43 | sysalarm_set | 44 | 1 | Analog Output 12 HIGH |
| 44 | sysalarm_set | 45 | 1 | Analog Output 13 HIGH |
| 45 | sysalarm_set | 46 | 1 | Analog Output 14 HIGH |
| 46 | sysalarm_set | 47 | 1 | Analog Output 15 HIGH |
| 47 | sysalarm_set | 48 | 1 | Analog Output 16 HIGH |
| 48 | sysalarm_set | 49 | 1 | Analog Output 1 LOW |
| 49 | sysalarm_set | 50 | 1 | Analog Output 2 LOW |
| 50 | sysalarm_set | 51 | 1 | Analog Output 3 LOW |
| 51 | sysalarm_set | 52 | 1 | Analog Output 4 LOW |
| 52 | sysalarm_set | 53 | 1 | Analog Output 5 LOW |
| 53 | sysalarm_set | 54 | 1 | Analog Output 6 LOW |
| 54 | sysalarm_set | 55 | 1 | Analog Output 7 LOW |
| 55 | sysalarm_set | 56 | 1 | Analog Output 8 LOW |
| 56 | sysalarm_set | 57 | 1 | Analog Output 9 LOW |
| 57 | sysalarm_set | 58 | 1 | Analog Output 10 LOW |
| 58 | sysalarm_set | 59 | 1 | Analog Output 11 LOW |
| 59 | sysalarm_set | 60 | 1 | Analog Output 12 LOW |
| 60 | sysalarm_set | 61 | 1 | Analog Output 13 LOW |
| 61 | sysalarm_set | 62 | 1 | Analog Output 14 LOW |
| 62 | sysalarm_set | 63 | 1 | Analog Output 15 LOW |
| 63 | sysalarm_set | 64 | 1 | Analog Output 16 LOW |
| 64 | sysalarm_set | 65 | 1 | Analyzer Failure |
| 65 | sysalarm_set | 66 | 1 | Power Failure |
| 66 | sysalarm_set | 67 | 1 | Fused Peak Overflow - Noisy Baseline |
| 67 | sysalarm_set | 68 | 1 | CPU Battery Low |
| 68 | sysalarm_set | 69 | 1 | GC Idle |
| 69 | sysalarm_set | 70 | 1 | Real-Time Clock Failure |
| 70 | sysalarm_set | 71 | 1 | Analog Input 1 HIGH |
| 71 | sysalarm_set | 72 | 1 | Analog Input 2 HIGH |
| 72 | sysalarm_set | 73 | 1 | Analog Input 3 HIGH |
| 73 | sysalarm_set | 74 | 1 | Analog Input 4 HIGH |
| 74 | sysalarm_set | 75 | 1 | Analog Input 1 LOW |
| 75 | sysalarm_set | 76 | 1 | Analog Input 2 LOW |
| 76 | sysalarm_set | 77 | 1 | Analog Input 3 LOW |
| 77 | sysalarm_set | 78 | 1 | Analog Input 4 LOW |
| 78 | sysalarm_set | 79 | 1 | NA |
| 79 | sysalarm_set | 80 | 1 | NA |
| 80 | sysalarm_set | 81 | 1 | NA |
| 81 | sysalarm_set | 82 | 1 | NA |
| 82 | sysalarm_set | 83 | 1 | NA |
| 83 | sysalarm_set | 84 | 1 | NA |
| 84 | sysalarm_set | 85 | 1 | NA |
| 85 | lmtalarm_set | 1 | 1 | |
| 86 | lmtalarm_set | 2 | 1 | |
| 87 | lmtalarm_set | 3 | 1 | |
| 88 | lmtalarm_set | 4 | 1 | |
| 89 | lmtalarm_set | 5 | 1 | |

| | | | | | |
|---|---|---|---|---|---|
| 90 | lmtalarm_set | | 6 | 1 | |
| 91 | lmtalarm_set | | 7 | 1 | |
| 92 | lmtalarm_set | | 8 | 1 | |
| 93 | lmtalarm_set | | 9 | 1 | |
| 94 | lmtalarm_set | | 10 | 1 | |
| 95 | lmtalarm_set | | 11 | 1 | |
| 96 | lmtalarm_set | | 12 | 1 | |
| 97 | lmtalarm_set | | 13 | 1 | |
| 98 | lmtalarm_set | | 14 | 1 | |
| 99 | lmtalarm_set | | 15 | 1 | |
| 100 | lmtalarm_set | | 16 | 1 | |
| 101 | lmtalarm_set | | 17 | 1 | |
| 102 | lmtalarm_set | | 18 | 1 | |
| 103 | lmtalarm_set | | 19 | 1 | |
| 104 | lmtalarm_set | | 20 | 1 | |
| 105 | stream_data | stream_togg | 1 | 1 | Stream 1 |
| 106 | stream_data | stream_togg | 2 | 1 | Stream 2 |
| 107 | stream_data | stream_togg | 3 | 1 | Stream 3 |
| 108 | stream_data | stream_togg | 4 | 1 | Stream 4 |
| 109 | stream_data | stream_togg | 5 | 1 | Stream 5 |
| 110 | stream_data | stream_togg | 6 | 1 | Stream 6 |
| 111 | stream_data | stream_togg | 7 | 1 | Stream 7 |
| 112 | stream_data | stream_togg | 8 | 1 | Stream 8 |
| 113 | doutcur | | 1 | 1 | |
| 114 | doutcur | | 2 | 1 | |
| 115 | doutcur | | 3 | 1 | |
| 116 | doutcur | | 4 | 1 | |
| 117 | doutcur | | 5 | 1 | |

## F.2.1 SIM_2251 MODBUS REGISTER LIST

**NOTICE**

**The information in the following tables is derived from engineering specification number ES-17128-005, "Model 2251 Enhanced Specification Chromatograph Controller Modbus Communication Indices" and has been updated for the 2350A GC Controllers.**

| G.3 (continued) SIM_2251 MODBUS REGISTER LIST | |
|---|---|
| **Reg. No.** | **Description** |
| 3001 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #1 |
| 3002 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #2 |
| 3003 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #3 |
| 3004 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #4 |
| 3005 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #5 |
| 3006 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #6 |
| 3007 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #7 |
| 3008 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #8 |
| 3009 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #9 |
| 3010 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #10 |
| 3011 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #11 |
| 3012 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #12 |
| 3013 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #13 |
| 3014 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #14 |
| 3015 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #15 |
| 3016 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #16 |
| 3017 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #1 |
| 3018 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #2 |
| 3019 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #3 |

| G.3 (continued) SIM_2251 MODBUS REGISTER LIST | |
|---|---|
| **Reg. No.** | **Description** |
| 3020 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #4 |
| 3021 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #5 |
| 3022 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #6 |
| 3023 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #7 |
| 3024 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #8 |
| 3025 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #9 |
| 3026 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #10 |
| 3027 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #11 |
| 3028 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #12 |
| 3029 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #13 |
| 3030 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #14 |
| 3031 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #15 |
| 3032 | Component Table *n* (where *n* = CDT # used during last run) - Component Index #16 |
| 3033 | Analysis Time (in 1/30ths of 1 second) |
| 3034 | Current Stream |
| 3035 | Mask of streams associated with Component Table #1 (Bit $2^n$ = 1 implies stream n included) |
| 3036 | Current Month(1-12) |
| 3037 | Current Day(1-31) |
| 3038 | Current Year(0-99) |
| 3039 | Current Hour(0-24) |
| 3040 | Current Minutes(0-59) |
| 3041 | Cycle Start Time - Month |
| 3042 | Cycle Start Time - Day |
| 3043 | Cycle Start Time - Year |
| 3044 | Cycle Start Time - Hour |
| 3045 | Cycle Start Time - Minutes |

G.3 (continued) **SIM_2251 MODBUS REGISTER LIST**

| Reg. No. | Description | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BIT NUMBER | | | | | | | | | | | | | | | |
| | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 3046 | checksum failure | anlyzr failure | D/A 3 high | D/A 3 low | D/A 2 high | D/A 2 low | D/A 1 high | D/A 1 low | spare | spare | A/D 2 high | A/D 2 low | A/D 1 high | A/D 1 low | spare | spare |
| 3047 | spare | spare | spare | spare | spare | spare | spare | spare | spare | spare | spare | spare | adjust preamp | preamp failure | rf % dev | power fail |
| 3048 | stream number 1 | | | | | | | | | | | | | | | |
| | | #15 low | #14 low | #13 low | #12 low | #11 low | #10 low | #9 low | #8 low | #7 low | #6 low | #5 low | #4 low | #3 low | #2 low | O.D.A #1 low |
| 3049 | stream number 1 | | | | | | | | | | | | | | | |
| | | #15 high | #14 high | #13 high | #12 high | #11 high | #10 high | #9 high | #8 high | #7 high | #6 high | #5 high | #4 high | #3 high | #2 high | O.D.A #1 high |
| 3050 | stream number 2 | | | | | | | | | | | | | | | |
| | | #15 low | #14 low | #13 low | #12 low | #11 low | #10 low | #9 low | #8 low | #7 low | #6 low | #5 low | #4 low | #3 low | #2 low | O.D.A #1 low |
| 3051 | stream number 2 | | | | | | | | | | | | | | | |
| | | #15 high | #14 high | #13 high | #12 high | #11 high | #10 high | #9 high | #8 high | #7 high | #6 high | #5 high | #4 high | #3 high | #2 high | O.D.A #1 high |
| 3052 | stream number 3 | | | | | | | | | | | | | | | |
| | | #15 low | #14 low | #13 low | #12 low | #11 low | #10 low | #9 low | #8 low | #7 low | #6 low | #5 low | #4 low | #3 low | #2 low | O.D.A #1 low |
| 3053 | stream number 3 | | | | | | | | | | | | | | | |
| | | #15 high | #14 high | #13 high | #12 high | #11 high | #10 high | #9 high | #8 high | #7 high | #6 high | #5 high | #4 high | #3 high | #2 high | O.D.A #1 high |
| 3054 | stream number 4 | | | | | | | | | | | | | | | |
| | | #15 low | #14 low | #13 low | #12 low | #11 low | #10 low | #9 low | #8 low | #7 low | #6 low | #5 low | #4 low | #3 low | #2 low | O.D.A #1 low |
| 3055 | stream number 4 | | | | | | | | | | | | | | | |
| | | #15 high | #14 high | #13 high | #12 high | #11 high | #10 high | #9 high | #8 high | #7 high | #6 high | #5 high | #4 high | #3 high | #2 high | O.D.A #1 high |
| 3056 | stream number 5 | | | | | | | | | | | | | | | |
| | | #15 low | #14 low | #13 low | #12 low | #11 low | #10 low | #9 low | #8 low | #7 low | #6 low | #5 low | #4 low | #3 low | #2 low | O.D.A #1 low |
| 3057 | stream number 5 | | | | | | | | | | | | | | | |
| | | #15 high | #14 high | #13 high | #12 high | #11 high | #10 high | #9 high | #8 high | #7 high | #6 high | #5 high | #4 high | #3 high | #2 high | O.D.A #1 high |
| 3058 | New data flag. Set upon completion of calculations. | | | | | | | | | | | | | | | |

| G.3 (continued) **SIM_2251 MODBUS REGISTER LIST** | |
|---|---|
| **Reg. No.** | **Description** |
| 3059 | Cal/Analysis flag. Set = 1 if analysis data. Set = 0 if calculation data. |
| 32-BIT INTEGERS | |
| 5001 | Cycle Time (in 1/30ths of 1 second) |
| 5002 | Calibration Cycle time (in 1/30ths of 1 second) |
| FLOATING POINT (proposed - IEEE KCS Standard Format)<br>**NOTE**: The following registers will contain **0** (zero) values until at least one analysis run has occurred. | |
| 7001 | Mole % - Component #1 |
| 7002 | Mole % - Component #2 |
| 7003 | Mole % - Component #3 |
| 7004 | Mole % - Component #4 |
| 7005 | Mole % - Component #5 |
| 7006 | Mole % - Component #6 |
| 7007 | Mole % - Component #7 |
| 7008 | Mole % - Component #8 |
| 7009 | Mole % - Component #9 |
| 7010 | Mole % - Component #10 |
| 7011 | Mole % - Component #11 |
| 7012 | Mole % - Component #12 |
| 7013 | Mole % - Component #13 |
| 7014 | Mole % - Component #14 |
| 7015 | Mole % - Component #15 |
| 7016 | Mole % - Component #16 |
| 7017 | GPM or Weight % - Component #1 |
| 7018 | GPM or Weight % - Component #2 |
| 7019 | GPM or Weight % - Component #3 |
| 7020 | GPM or Weight % - Component #4 |
| 7021 | GPM or Weight % - Component #5 |

| G.3 (continued) SIM 2251 MODBUS REGISTER LIST | |
|---|---|
| **Reg. No.** | **Description** |
| 7022 | GPM or Weight % - Component #6 |
| 7023 | GPM or Weight % - Component #7 |
| 7024 | GPM or Weight % - Component #8 |
| 7025 | GPM or Weight % - Component #9 |
| 7026 | GPM or Weight % - Component #10 |
| 7027 | GPM or Weight % - Component #11 |
| 7028 | GPM or Weight % - Component #12 |
| 7029 | GPM or Weight % - Component #13 |
| 7030 | GPM or Weight % - Component #14 |
| 7031 | GPM or Weight % - Component #15 |
| 7032 | GPM or Weight % - Component #16 |
| 7033 | BTU - Dry |
| 7034 | BTU - Saturated |
| 7035 | Specific Gravity |
| 7036 | Compressibility |
| 7037 | WOBBE Index |
| 7038 | Total Unnormalized Mole % |
| 7039 | Total GPM |
| 7040 | Calculation, User Defined 1 |
| 7041 | Calculation, User Defined 2 |
| 7042 | Calculation, User Defined 3 |
| 7043 | Calculation, User Defined 4 |
| 7044 | Calculation, User Defined 5 |
| 7045-7053 | Unused |
| 7054 | Actual BTU |
| 7055 | Average, User Defined 1 |

| G.3 (continued) **SIM_2251 MODBUS REGISTER LIST** | |
|---|---|
| **Reg. No.** | **Description** |
| 7056 | Average, User Defined 2 |
| 7057 | Average, User Defined 3 |
| 7058 | Average, User Defined 4 |
| 7059 | Average, User Defined 5 |
| 7060 | Average, User Defined 6 |
| 7061 | Average, User Defined 7 |
| 7062 | Average, User Defined 8 |
| 7063 | Average, User Defined 9 |
| 7064 | Average, User Defined 10 |
| 7065 | Average, User Defined 11 |
| 7066 | Average, User Defined 12 |
| 7067 | Average, User Defined 13 |
| 7068 | Average, User Defined 14 |
| 7069 | Average, User Defined 15 |
| 7070 | First Archive of Average, User Defined 1 |
| 7071 | First Archive of Average, User Defined 2 |
| 7072 | First Archive of Average, User Defined 3 |
| 7073 | First Archive of Average, User Defined 4 |
| 7074 | First Archive of Average, User Defined 5 |
| 7075 | First Archive of Average, User Defined 6 |
| 7076 | First Archive of Average, User Defined 7 |
| 7077 | First Archive of Average, User Defined 8 |
| 7078 | First Archive of Average, User Defined 9 |
| 7079 | First Archive of Average, User Defined 10 |
| 7080 | First Archive of Average, User Defined 11 |
| 7081 | First Archive of Average, User Defined 12 |
| 7082 | First Archive of Average, User Defined 13 |

| G.3 (continued) **SIM_2251 MODBUS REGISTER LIST** | |
|---|---|
| **Reg. No.** | **Description** |
| 7083 | First Archive of Average, User Defined 14 |
| 7084 | First Archive of Average, User Defined 15 |
| 7085 | Analog Input #1 - Current Value in Engineering Units |
| 7086 | Analog Input #2 - Current Value in Engineering Units |
| 7087 | Actual BTU (last calibration) |
| 7088 | Dry BTU (last calibration) |
| 7089 | Sat BTU (last calibration) |
| 7090 | Wobbe Index (last calibration) |
| 7091 | Relative Density (last calibration) |
| 7092 | Compressibility (last calibration) |
| 7093 | Total GPM (last calibration) |
| 7094 | Total Unnormalized (last calibration) |
| 7095-7110 | Response Factors (#1-16), Component Table *n* (where *n* = CDT # used during last run) |
| 7111-7126 | Response Factors (#1-16), Component Table *n* (where *n* = CDT # used during last run) |
| 7127-7162 | Averages, User Defined 1-36<br>(NOTE: First fifteen, or registers 7127-7141, are repeats of contents of registers 7055-7069) |
| 7163-7198 | Maximum values from Averages, User Defined 1-36 |
| 7199-7234 | Minimum values from Averages, User Defined 1-36 |
| 7235-7270 | First (most recent) Archive of Averages, User Defined 1-36<br>(NOTE: First fifteen, or registers 7235-7249, are repeats of contents of registers 7070-7084) |
| 7271-7306 | First (most recent) Archive of Maximum values from Averages, User Defined 1-36 |
| 7307-7342 | First (most recent) Archive of Minimum values from Averages, User Defined 1-36 |
| 7343-7378 | Second Archive of Averages, User Defined 1-36 |

| G.3 (continued) **SIM_2251 MODBUS REGISTER LIST** | |
|---|---|
| **Reg. No.** | **Description** |
| 7379-7414 | Second Archive of Maximum values from Averages, User Defined 1-36 |
| 7415-7450 | Second Archive of Minimum values from Averages, User Defined 1-36 |
| 7451-7486 | Third (oldest) Archive of Averages, User Defined 1-36 |
| 7487-7522 | Third (oldest) Archive of Maximum values from Averages, User Defined 1-36 |
| 7523-7558 | Third (oldest) Archive of Minimum values from Averages, User Defined 1-36 |

G.3 (continued) **SIM_2251 MODBUS COMMUNICATION INDICES**

| **Reg. No.** | **Description**: RW = read/write (1) or read-only (0)<br>LEN = length<br>REGS = number of Modbus registers required | | | | |
|---|---|---|---|---|---|
| | RW | TYPE | LEN | REGS | VARIABLE NAME, POINTER, or DESCRIPTION |
| 9001 | 0 | string | 6 | 3 | device model number |
| 9004 | 0 | string | 4 | 2 | software revision |
| 9006 | 1 | integer | 2 | 1 | system time month (1-12) |
| 9007 | 1 | integer | 2 | 1 | system time day (1-31) |
| 9008 | 1 | integer | 2 | 1 | system time year (0-99) |
| 9009 | 1 | integer | 2 | 1 | system time hour (0-23) |
| 9010 | 1 | integer | 2 | 1 | system time minutes (0-59) |
| 9011 | 1 | integer | 2 | 1 | system time seconds (0-59) |
| 9012 | 1 | integer | 2 | 1 | system time day (0-6) |
| 9013 | 0 | integer | 2 | 1 | plug id (Modbus or Device ID, per DIP switch settings) |
| 9014 | 1 | long | 4 | 2 | site id |
| 9016 | 0 | string | 12 | 5 | device serial number |
| 9022 | 0 | integer | 2 | 1 | analysis time 1 |
| 9023 | 0 | integer | 2 | 1 | analysis time 2 (for dual detector system) |
| 9024 | 0 | integer | 2 | 1 | cycle time 1 |

| G.3 (continued) **SIM_2251 MODBUS COMMUNICATION INDICES** | | | | | |
|---|---|---|---|---|---|
| **Reg. No.** | **Description:** RW = read/write (1) or read-only (0)<br>LEN = length<br>REGS = number of Modbus registers required | | | | |
| | RW | TYPE | LEN | REGS | VARIABLE NAME, POINTER, or DESCRIPTION |
| 9025 | 0 | integer | 2 | 1 | cycle time 2 (for dual detector system) |
| 9026 | 0 | integer | 2 | 1 | run time 1 |
| 9027 | 0 | integer | 2 | 1 | run time 2 (for dual detector system) |
| 9028 | 0 | integer | 2 | 1 | current stream 1 |
| 9029 | 0 | integer | 2 | 1 | current stream 2 (for dual detector system) |
| 9030 | 0 | integer | 2 | 1 | system mode 1 |
| 9031 | 0 | integer | 2 | 1 | system mode 2 (for dual detector system) |
| 9032 | 0 | integer | 2 | 1 | calibrating 1 |
| 9033 | 0 | integer | 2 | 1 | calibrating 2 (for dual detector system) |
| 9034 | 0 | integer | 2 | 1 | active alarm (red light at GC controller) |
| 9035 | 0 | integer | 2 | 1 | unack'd alarm (yellow light at GC controller) |
| 9036 | 0 | integer | 2 | 1 | hourly average reset - year |
| 9037 | 0 | integer | 2 | 1 | hourly average reset - month |
| 9038 | 0 | integer | 2 | 1 | hourly average reset - day |
| 9039 | 0 | integer | 2 | 1 | hourly average reset - hour |
| 9040 | 0 | integer | 2 | 1 | hourly average reset - minutes |
| 9041 | 0 | integer | 2 | 1 | 24-hour average reset - year |
| 9042 | 0 | integer | 2 | 1 | 24-hour average reset - month |
| 9043 | 0 | integer | 2 | 1 | 24-hour average reset - day |
| 9044 | 0 | integer | 2 | 1 | 24-hour average reset - hour |
| 9045 | 0 | integer | 2 | 1 | 24-hour average reset - minutes |
| 9046 | 0 | integer | 2 | 1 | weekly average reset - year |
| 9047 | 0 | integer | 2 | 1 | weekly average reset - month |
| 9048 | 0 | integer | 2 | 1 | weekly average reset - day |
| 9049 | 0 | integer | 2 | 1 | weekly average reset - hour |

| G.3 (continued) **SIM_2251 MODBUS COMMUNICATION INDICES** | | | | | |
|---|---|---|---|---|---|
| **Reg. No.** | **Description:** RW = read/write (1) or read-only (0)<br>LEN = length<br>REGS = number of Modbus registers required | | | | |
| | RW | TYPE | LEN | REGS | VARIABLE NAME, POINTER, or DESCRIPTION |
| 9050 | 0 | integer | 2 | 1 | weekly average reset - minutes |
| 9051 | 0 | integer | 2 | 1 | monthly average reset - year |
| 9052 | 0 | integer | 2 | 1 | monthly average reset - month |
| 9053 | 0 | integer | 2 | 1 | monthly average reset - day |
| 9054 | 0 | integer | 2 | 1 | monthly average reset - hour |
| 9055 | 0 | integer | 2 | 1 | monthly average reset - minutes |
| 9056 | 0 | integer | 2 | 1 | variable average reset - year |
| 9057 | 0 | integer | 2 | 1 | variable average reset - month |
| 9058 | 0 | integer | 2 | 1 | variable average reset - day |
| 9059 | 0 | integer | 2 | 1 | variable average reset - hour |
| 9060 | 0 | integer | 2 | 1 | variable average reset - minutes |

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## WARRANTY CLAIM PROCEDURES

To make a warranty claim, you, the Purchaser, must:

1. Provide Daniel with proof of the Date of Purchase and proof of the Date of Shipment of the product in question.
2. Return the product to Daniel within twelve (12) months of the date of original shipment of the product, or within eighteen (18) months of the date of original shipment of the product to destinations outside of the United States. The Purchaser must prepay any shipping charges. In addition, the Purchaser is responsible for insuring any product shipped for return, and assumes the risk of loss of the product during shipment.
3. To obtain Warranty service or to locate the nearest DMS office, sales, or service center call (713) 827-6314, Fax (713) 827-6312, or write to:

   Daniel Measurement Services
   11100 Brittmore Park Drive
   Houston, Texas 77041

   Or contact DMS via the following site
   **www.emersonprocess.com/daniel**

4. When contacting DMS for product service, the Purchaser is asked to provide information as indicated on the following page entitled "Customer Repair Report".
5. For product returns from locations outside the United States, it will be necessary for you to obtain the import consignment address so that DMS's customs broker can handle the importation with the U.S. Customs Service.
6. DMS offers both on call and contract maintenance service designed to afford single source responsibility for all its products.
7. DMS reserves the right to make changes at any time to any product to improve its design and to insure the best available product.

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_____

_____

SHIPPING ADDRESS: _____

_____

RETURN SHIPPING METHOD: _____

EQUIPMENT MODEL #:_____ S/N:_____FAILURE DATE: _____

DESCRIPTION OF PROBLEM: _____

_____

_____

WHAT WAS HAPPENING AT TIME OF FAILURE? _____

_____

ADDITIONAL COMMENTS:_____

_____

_____

REPORT PREPARED BY:_____ TITLE: _____

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